THE RHODESIA

Agricultural Journal.

Issued by Authority of
the Minister of Agriculture and Lands.

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Leading Features.

PUBLISHED MONTHLY.

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Contents.

Contents.

Contents.

Contents.

Contents.

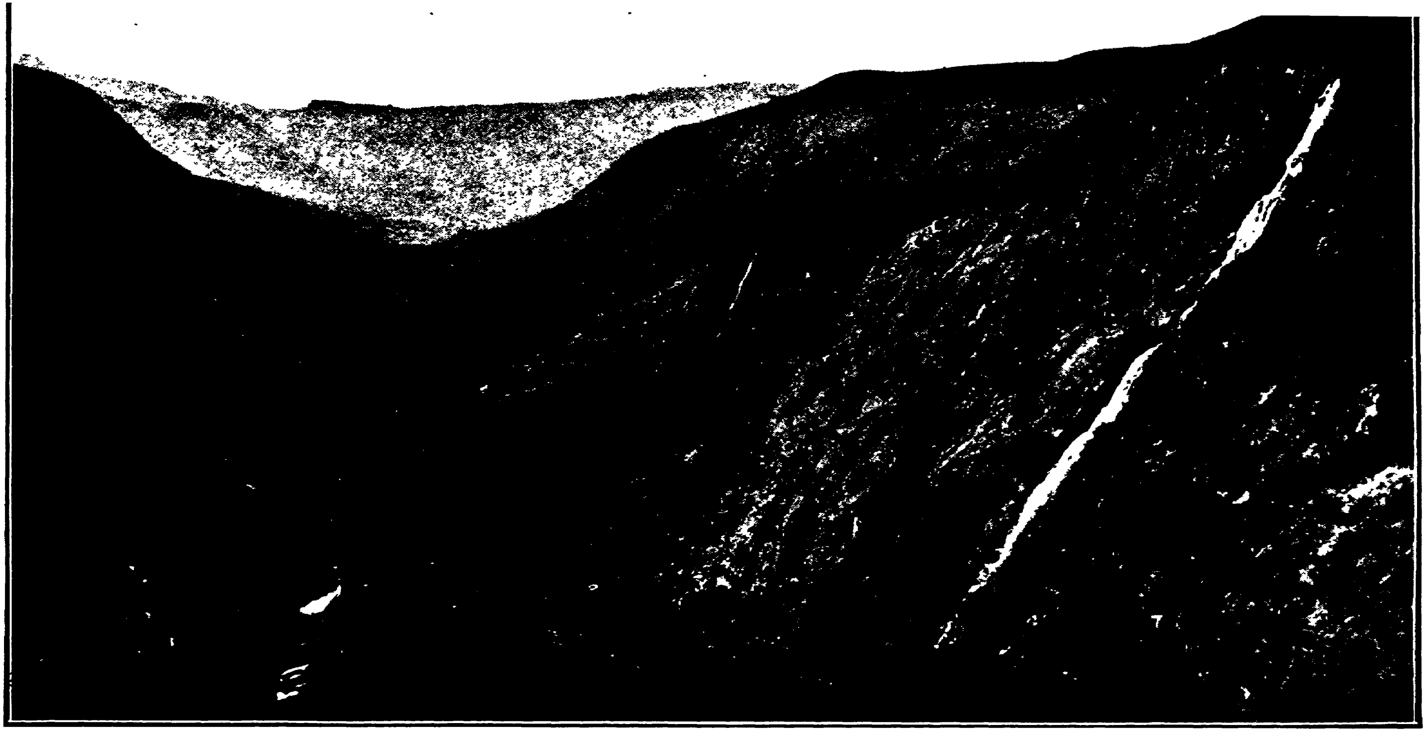
Contents.

Contents.

Contents.

Contents.

Contents.



Pungwe Gorge, Inyanga District.

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Editor - - *W. E. Meade.*

VOL. XXIV.] JANUARY, 1927. [NO. 1.

Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The New Year.—With the advent of a New Year we wish all our readers prosperity and happiness, and trust that the season will bring them a fruitful reward for their labours. So far conditions are propitious, and we hope that no untoward caprice of the weather will occur to mar the prospects of a bountiful harvest. The absence of rain in the months of November and December gave rise to some anxiety, but December has brought with it good soaking downpours, which have been general over the greater part of the Colony, and which, it is hoped, will continue in moderation during the growing season. Tobacco has been planted on a very con-

siderable scale, and there will probably be a record crop. Most of the settlers who have arrived in the Colony recently are making tobacco their main crop, while many farmers who have not hitherto grown tobacco have set out acreages. The danger may be that a good deal of inferior leaf will be grown by some in their efforts to market a big crop, and it is here that disappointment will arise. With the United Kingdom as our principal market, it is essential that we send tobacco of suitable quality, for our leaf is now, within its limits, being used as a substitute for American. The manufacturer expects quality in Rhodesian tobacco, and any lowering of the standard will do the Colony immeasurable harm.

Cotton does not loom so largely in popular favour as it did two years ago. Bad seasons and a severe slump in prices have damped enthusiasm for the crop, which will be considerably reduced in acreage this season. Experience has proved, however, that cotton can be grown successfully in certain parts of the Colony, and with the return of better prices it is probable that cotton will occupy a conspicuous place in our agricultural exports.

Cattle have appreciated in price during the past few months, and the position in this respect is better than it has been for some years. Extensive sales have materially reduced the numbers of inferior cattle in the Colony, and we trust that the process of attrition will be continued until the "scrub" is entirely eliminated. The presence of African Coast Fever is disquieting, but it is hoped that the efforts of the veterinary staff, aided by the loyal co-operation of stock owners, will once and for all eradicate the disease.

In spite of periodical setbacks and difficulties, the agricultural industry of the Colony is making steady and satisfactory progress. Our maize, tobacco, citrus fruits, cotton, beef, and in a smaller measure our dairy products, have entered the markets of the world, and are holding their own in open competition. The extent to which we shall increase our hold on these markets depends entirely upon our own efforts. One and all must work together. We are competing with highly efficient marketing organisations with years of experience behind them, and if we hope to succeed we must all work for the common end.

Obituary—Mr. Llewelyn Lloyd.—We very much regret to record the death of Mr. Llewelyn Lloyd, at his residence, Gorubi Springs Farm, Inyazura, on the 11th December. Mr. Lloyd was a very old resident of Rhodesia, having come to the country some 30 years ago from Natal. He was well known in Salisbury, where he held various appointments, including that of manager of the Rhodesian Farmers' Co-operative Society, Limited. For the past ten years he had been farming on an extensive scale at Gorubi Springs, where he owned a ranch of about 20,000 acres. Maize growing and cattle rearing were the main pursuits carried on at the farm, but Mr. Lloyd also specialised in horse breeding, for which he earned a wide reputation throughout Mashonaland.

The funeral took place at the Church of England section of the Salisbury Cemetery on the 13th December, and was attended by a large and representative concourse of mourners. Deceased is survived by his wife, daughter and son, to whom we offer our sincere sympathy.

South African Farmers' Tour.—We have received the itinerary of the South African farmers' tour of Europe and America, which is being arranged under the auspices of the South African National Union. The party is to consist of 60 farmers, twelve from each Province of the Union and twelve from Rhodesia. The European tour, which occupies 46 days, is designed to cover the markets and farming centres of England, Scotland and many of the principal towns on the Continent, and to include about two weeks in Holland and Denmark, with the object of studying in the latter country dairying and co-operation. The European tour is a very comprehensive one, and farmers will be able to learn a great deal about farming and farming economics. A qualified man, probably the secretary of the South African Agricultural Union, will accompany the tourists throughout. The American itinerary of 78 days was prepared by the Bureau of Agricultural Economics in Washington. This should also prove a very educative trip. The party will leave Capetown by the Balmoral Castle on Friday, the 27th May, and will return from Southampton on the 29th July.

The Rhodesia Agricultural Union has charge of the arrangements in so far as Rhodesia is concerned, and has circularised all farmers' associations. It is expected that this Colony will provide its quota of farmer tourists.

Cattle Dip Control Act, 1926.—This Act, which was passed at the recent session of the Legislative Assembly and promulgated in the *Gazette* of 17th December, provides that vendors and importers of cattle dip shall keep a record of all cattle dip which is acquired or disposed of by them from time to time, together with the names of the persons to whom it is disposed of and the date of the transaction. It is stipulated that the book in which this record is kept shall be available for examination by any inspector appointed for the purposes of the "Cattle Cleansing Ordinance, 1918."

In introducing the Bill the Hon. the Minister of Agriculture and Lands said that the subject matter of the Bill was first suggested to the Government by the Cost of Administration Commission in 1924. The object that the Government had in mind was to make the officials concerned better informed as regards the importation and distribution of dip. It was felt that the new law would assist cattle inspectors and veterinary surgeons in the carrying out of their duties, and, though not directly, it would help the veterinary officials to learn who are regular cattle dippers and who are not.

The ultimate object of the Bill is, of course, to assist in the eradication of African Coast Fever, and as such it will, we feel sure, have the blessing of stock owners.

The Laboratory Diagnosis of Animal Diseases.—In an article which appeared in the issue of this Journal for June, 1924, the Director of Veterinary Research emphasised the necessity for the early and correct diagnosis of animal diseases, and explained in simple language how preparations should be forwarded for laboratory examination in various circumstances. Mr. Bevan expressed himself as follows:—"In this country it is of the utmost importance that the

cause of death of every animal should be accurately determined. If cases of infective disease are overlooked, the infection may be distributed far and wide, and incalculable damage may be done before administrative measures can be taken to arrest it. Whenever possible, therefore, preparations should be taken from the sick or dead animal and should be submitted to the Veterinary Laboratory for examination. For this purpose special glasses and wrappers will be supplied, and all that remains is for the stockman to acquaint himself with the method of preparing, collecting and forwarding the material for examination."

We draw special attention to this article in view of the efforts which are being made to eradicate African Coast Fever and the importance of the subject, and to the fact that special glasses for the taking of smears are supplied free by the Veterinary Laboratory, together with addressed wrappers for forwarding them. The article was reprinted in bulletin form, but unfortunately our supply has been exhausted. The Director of Veterinary Research, however, has a few copies for distribution free of charge, and we advise those stock owners who have not their Journal by them to apply to him for a copy.

The Settlers' Handbook.—With the interest which is now being manifested in Southern Rhodesia as a suitable field for settlement, it is very desirable that there should be available in handy form information regarding the conditions of life here and the opportunities which the Colony has to offer for obtaining a livelihood. This need is admirably served by the handbook recently issued by the direction of the Honourable the Minister of Agriculture and Lands for the use of prospective settlers on the land, and obtainable from the office of the High Commissioner for Southern Rhodesia in London and the Department of Lands. The book is a revision of an earlier edition, and it is now almost as complete as it can be made. For instance, in addition to chapters on such main topics as rainfall, climate, taking up land, health, principal crops, forestry, animal industries, etc., information is given regarding facilities for education, income tax, cost of living, salaries, employment, clothing, furniture and many

other items which naturally interest anyone who is contemplating settling in a new country, but in regard to which it is often difficult to get information. The chapters relating to crops and kindred subjects are necessarily abbreviated, but the information given can be amplified by obtaining the bulletins issued by this Department free of charge. The book contains an orographical map, a geological map, a rainfall distribution map, and a mineral map, each of which will be found extremely useful to the prospective settler.

The following extract may usefully be reproduced here:

"The policy of the Department of Lands is to advise all prospective settlers (irrespective of their age or previous experience) to give themselves time thoroughly to learn local conditions before taking any serious steps towards investing their capital. The Department is prepared to arrange for training with well-known established farmers on very reasonable terms, which, as a rule, do not exceed £5 or £6 a month, and are merely intended to cover the bare cost of board and lodging. . . .

"In many cases no grant of Crown land will be made until the Department is satisfied that the settler has received sufficient training, and is capable of satisfactorily developing land with a reasonable prospect of success."

Amending the Fencing Law.—A measure of considerable importance to the farming community is the Fencing Law Amendment Bill, which was passed at the recent session of the Legislative Assembly and promulgated in the *Gazette* of 10th December. The principal effect of the Bill is to impose the obligation on all owners throughout the Colony to contribute towards the cost of boundary fences. Previously it was necessary to obtain a majority of two-thirds of the farmers in an area before the provisions of the Ordinance could be applied.

Section 1 of the Amending Bill extends the scope of the meaning of the word "owner," so as to include persons holding or occupying Crown land in terms of any agreement made with the Government. This means that persons holding farms under "agreement of purchase" title or "permit of

occupation" title may be called upon to pay their share of the cost of a boundary fence. An amendment of section 11 of the Ordinance strengthens the position of occupiers of farms as against absentee owners and reads: "On the completion of the fence as aforesaid, he may, on furnishing to the magistrate such particulars as may be required by the said magistrate, request that a certificate be prepared setting out the proportion of the cost of fencing regarded by the magistrate as properly chargeable to the owner of the adjoining land. The Registrar of Deeds, on receiving a certificate as aforesaid from the magistrate, shall make an entry thereof in respect of the land affected. Such entry shall constitute a hypothecation of the land, ranking from the date on which the entry was made and for the amount stated therein."

In introducing the Bill the hon. the Minister of Agriculture and Lands remarked that during the last five years there had been no hypothecation against absentee owners who had been called upon to provide fencing, and this he considered was an indication that the whole farming community were desirous of extending the scope of the Fencing Ordinance. He also mentioned that since the present Government came into office applications had been received from farmers in twelve different districts asking the Government to apply the provisions of the Ordinance throughout those districts.

The Bill passed through the House without amendment.

Farm Accounting Associations.—We have received from the College of Agriculture of the University of California a copy of Bulletin 403, which describes the efforts made to encourage farm accounting in the United States of America. At the present time the Agricultural Extension Service of the College of Agriculture is extending the farm accounting idea by four different methods of keeping accounts: (1) By means of accounts kept by the individual farmer, (2) by means of farm accounts kept in banks, (3) by means of senior farm business clubs, and (4) by means of junior farm business clubs. The first method has not been successful. Account books were distributed to farmers

and but a few were kept. The second method has been used by eight banks in seven different counties in California, and in 1925 139 different accounts were kept for farmers. The third method has been tried, but has not been entirely satisfactory because of the difficulty in getting farmers to keep their own records. The original plan was to hold a meeting of this club once a month with the extension specialist in farm management and the farm adviser for a discussion of problems involved in the accounting work.

The interest of the young people in the community in farm accounting was stimulated during the summer of 1925 by the organisation of junior farm business clubs. The plan is to have a local banker act as local club leader. Inventories are taken by the club members, with the assistance of the parent and the representative of the bank. Material for making entries in account books is collected at the bank by having the parent pay all bills by cheque and itemising the nature of the expense. The parent also itemises the deposit slips as to the source of income. Once a month the club meets at the bank, and the members make entries in the farm account book under the direction of the banker.

The bulletin proceeds to give an account of the organisation and results of farm accounting associations in Europe, particularly those of Denmark.

It is stated that much of the effort in Denmark was first expended in generalising the system and making it uniform. This was brought about first by an agreement between various agencies as to the form of account most suitable to the kingdom as a whole. After agreement on this point, the next problem was to make the work of farm accounting known in the agricultural districts. Several agencies were entrusted with the task. Since Denmark possessed a system of well-organised agricultural societies, it was decided to interest these in the work. Meetings and short courses were held for those interested at the various agricultural schools and people's colleges. One of the serious problems in the way of extending farm accounting was a lack of trained men to take charge of the work. The various schools, including the Royal Agricultural College, were induced to train all students in accounting work, following the system agreed upon by the agencies previously mentioned.

The Danish farmer has been given an excellent training in self-government, which has promoted a rapid development of co-operative organisation and leadership. Also, the extensive system of agricultural education prevailing makes it possible for instruction to be given to a large proportion of the younger farmers.

Another advantage in extending the system of farm accounting work described is that Denmark is a small country, with a comparatively large number of small and medium farms owned by the operators. In addition, a comparatively uniform system of agriculture is the rule. It is said that the farm accounting association, with its steady and sure growth, augurs well to rival the cow-testing association in its scope and in its application to the business of farming in Denmark.

Empire Marketing Board.—We have received from the Empire Marketing Board a report on the activities of the Board since its inception in May last.

The Empire Marketing Board was established in accordance with a recommendation of the Imperial Economic Committee, who proposed in their first report that an "Executive Commission" should be formed "with the duty of conducting the movement for trade in Empire produce." The Board was established for this general purpose, and also for the purpose of advising the Secretary of State for Dominion Affairs as to the manner in which the annual grant of £1,000,000 (in the current financial year £500,000) should be expended in the furtherance of the sale of Empire products (including home-grown agricultural produce) in the United Kingdom. That grant, it will be remembered, was promised by the British Government in lieu of certain preference in favour of Empire-grown food-stuffs which the British Government, as the result of the events which followed the penultimate Imperial Conference, felt unable to put into effect.

The Government invited the Imperial Economic Committee to make suggestions as to the general lines on which this grant should be spent, and the Empire Marketing Board is charged with giving practical effect to such of the Com-

mittee's recommendations as may be approved by the British Government.

Thus the Board has a dual outlook. It gives counsel to the Secretary of State in his administration of a grant for which he must be responsible as a member of the Government to Parliament which has voted it. But, as the body which follows up the recommendation of the Imperial Economic Committee—a Committee directly responsible to the Prime Ministers of the Empire—it looks also towards the producers in all parts of the Empire, whose interests it seeks actively to serve. In this latter aspect, in particular, its work is of direct concern to both Governments and peoples overseas.

The Board was appointed towards the end of last May. It has since held regular meetings under Mr. Amery's chairmanship, and its work has been actively prosecuted by a number of Committees.

In a large measure the Board's work has been a continuation of the work of the Imperial Economic Committee, who have so far furnished four reports, viz.:—

General Report,
Meat Report,
Fruit Report,
Dairy Produce Report.

The Imperial Economic Committee laid down emphatically at the outset of their first report that the marketing of Empire products included the marketing of home-grown produce. "The whole Committee," they reported, "wish to see precedence given in the British market for food-stuffs in the following order:—

"Home Produce, first;
Dominion and Colonial Produce, second;
Foreign Produce, third."

The Board has never lost sight of the claims of the home producer as thus established.

The activities of the Board are grouped under the three headings of Publicity, Scientific Research and Economic Investigation. Under each of these headings a comprehensive campaign has been planned which is too diversified to permit of its enumeration here. It may be stated, however, that a scheme is being worked out for the free transport of pedigree

cattle from the United Kingdom to other parts of the Empire. It is certain that Empire products will be brought to the notice of the British housewife in a manner such as they never have been before, and it only remains for the producer to see to it that the quality of his commodity in no way suffers by comparison with that of the foreigner.

ERRATUM.

On page 1104 of the December issue of the *Rhodesia Agricultural Journal* it is stated that the dose of quarter evil French vaccine prepared by Leclainche and Vallée, of Toulouse, is 1-10 cc. This should read ½ cc.

Forestry in Southern Rhodesia.

THE RAISING OF PLANTS FROM CUTTINGS.

By A. S. THORNEWILL, B.A. and Dipl. in Forestry, Oxon.
Assistant to the Forest Officer.

Introduction.—The practice of raising plants from cuttings is well known and employed horticulturally; in forestry operations it is rarer, since the need for that form of propagation is less. Some forest trees, however, are raised from cuttings; and in forestry operations in countries where the science is in its infancy owing to lack of funds, lack of appreciation of its vital importance or to any other reason, a demand has to be met for transplants of ornamental trees and shrubs as well as those of timber trees. In such circumstances the trained forester has to comply in many cases by raising such plants, many of which grow from cuttings. A short account of methods employed is here given, which, it is hoped, will be of assistance to those who wish to strike their own cuttings, particularly if situated a considerable distance from rail.

It may here be stated that it is necessary for the propagator to beware of foreign advice. In this the writer in no way deprecates other works on the subject, but merely points out that with *all* methods of propagation there is a wide difference in the results obtained in different countries. General principles are the same all the world over, but their particular application varies considerably. In regard to the work of propagation from cuttings, conditions differ even more widely than in other operations. As an example it may be quoted that European writers advocate the raising from cuttings of acacias, conifers and even eucalypts. In Rhodesia no acacias nor eucalypts nor pines and hardly any conifers can be so raised.

Various Methods of Reproduction.—In theory nearly all flowering plants are capable of reproduction from seed, cuttings, layers, suckers, grafting, budding, etc. In practice this is not so; and some plants develop more strongly one method, *e.g.*, from seed, and some another; so that the remaining methods become more unlikely or even physiologically obsolete. This is known to be the case in general biology as well as in the more specialised respect of the flowering plants. A disused faculty ceases from functioning. A further note of interest is that when a more specialised plant is evolved, the tendency is for it to revert to the more primitive type when propagated by seed, and more to retain its evolved form when grown from cuttings or similar method.

How a Cutting Grows.—To get the best results from cuttings it is necessary to consider the manner in which a cutting grows. A cutting is a definitely severed part of the vegetative (*i.e.*, above ground) portion of the plant. In most cases it is part of a woody branch, *i.e.*, a hardwood cutting. In any case, under the bark there is a ring of tissue extending the whole way up, forming an enclosing sheath or cylinder. This is the cambial layer. It is upon the activity of this that the success of the cutting depends. Before the cutting was severed from its parent the innermost part of this sheath (the *Xylem*) passed food up to the leaves; the leaves manufactured this material into the final food form required by the plant and passed it down in the outermost layer (the *Phlœm*) for distribution to all living cells of the plant and for storage in certain of them. The centre part of this sheath (the *Cambium*) multiplied the cells of the *Xylem* within and of the *Phlœm* without. At the base of the cutting this combination of vessels is a microscopic ring (the cambial ring). By virtue of the food matter, both still in passage down the *Phlœm* and stored accessibly, the cambial ring is able to continue to increase. Thus two points of great importance emerge—first, the growth (*callus*) only takes place at the exposure point or points of the cambial ring in the ground; and secondly, such growth *depends entirely* on the food matter in the cutting, and can obviously take nothing from the soil till new roots are formed. In conformity with the nature of this growth, methods and details in general use are evolved.

Time for Striking Cuttings.—The best time to strike cuttings is from the middle to the end of the period of dormancy. In cuttings taken then a large amount of food matter is stored within the cells, and the majority of the flow of food is downwards and the minority of it upwards. The time varies in Rhodesia from July to September or even October. This may be modified both by the ability of the particular plant to reproduce from cutting and by the kind of season being experienced in any given year. Deciduous species should be struck when the plant is leafless. It should further be noted that some plants reproduce so easily from cuttings that success may be obtained at almost any period, provided ordinary care is taken; examples of such are mulberry (*Morus alba*), roses, poinsettia, frangipani, etc.

Making the Cutting.—The term cutting, unless otherwise stated herein, may be taken to mean "hardwood" cutting. The question of "softwood" cuttings will be referred to later. By a hardwood cutting is meant that taken from the growth resulting from one or more growing seasons. The cutting therefore should be taken from firm woody growth of the previous year. Provided this can be observed, re-growth from shoots taken from near the base is surer than from the remoter branches. The cuttings are thus taken as near the source of food supply (the roots) as possible. It follows, incidentally, that "stool" or coppice shoots, provided they are of firm enough wood, are the surest. An example of this is the garden fig when propagated by cuttings (though this, incidentally, is surer by other methods).

The thickness of the cutting should not be less than one-third of an inch, *i.e.*, about that of an ordinary pencil. The length of a cutting in the ordinary way may be from 6 to 12 inches. When the cutting is severed from the plant, it should be given a straight cut above a bud at the top and an oblique one below a bud at the bottom, the bud here to be opposite the upper end of the cut. Making a straight cut at the top exposes a minimum surface to drying out; making an oblique one at the bottom provides a maximum area to produce callus and root growth. In both cases the cut must be clean and the bark must not be torn. The branches and leaves must be trimmed off. It is further desirable in some

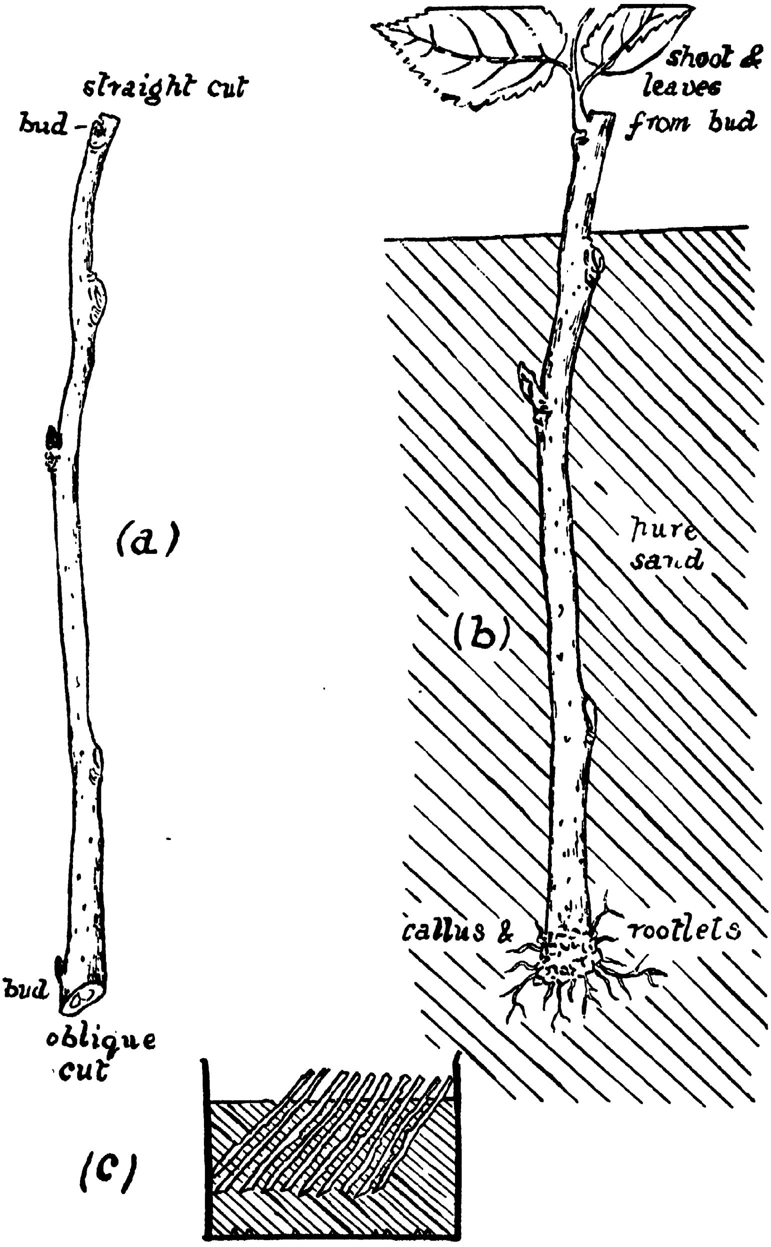


Fig. 1.
(a) Properly prepared hardwood cutting (mulberry); (b) same, ready for planting out; (c) cuttings in tin.

cases that the buds below ground should be removed, thus obviating any possibility of objectionable low branching growth. The grape vine is a case in point. Fig. 1 (a) is intended to show a properly prepared hardwood cutting (of *Morus alba*, mulberry).

Planting or "Setting."—Cuttings may be set in tins in rows or *in situ*. The lightest available soil only should be used—pure sand is best. At least two-thirds and preferably three-quarters of the length should be *in the ground*. In the case of tins, the usual holes for drainage are made (from the bottom upwards); stones or twigs are then laid in position and a layer of sand follows. The cuttings are then packed into the tin with sand as close as possible and the whole firmed and watered. See Figs. 1 (c) and 2 (a).

To set cuttings in rows, dig a trench having one side vertical; place the cuttings against the vertical side, and pack layer after layer of sand till the trench is full. If all the sand is put back at once and then firmed, there is a danger of the cutting being "hung," with air cavities below.

To plant cuttings *in situ*, a properly prepared trench 2 feet deep, with well pulverised soil, should be employed. *In situ* cuttings may be set rather later than others. In any case the bark of the cutting at the point of insertion must not be torn. Cuttings once made must be set without delay. They may be set vertical or slanting. If the former, there is less danger of the roots, if any formed, being injured in transplanting. If the latter, the part which is to develop callus and root growth is nearer to warmth, air and moisture. On the whole the latter method is the better.

Subsequent Care.—The cuttings, having been set, should be watered to settle the soil round them. They are then to be shaded so that filtered or diffused sunlight only is allowed access. They must be maintained, by watering and shading, in moist, warm and even temperature conditions. Fig. 2 (b) shows tins of cuttings being struck in these circumstances. When leaf growth begins to appear on the cuttings they may be hardened off slightly by giving more light and less water. When a full leaf flush is established the cuttings are ready for transplanting (Figs. 1 (b) and 2 (a)). They are then planted out into richer soil as for all ordinarily grown plants,

Fig. 2.
(a) Cuttings in tins of Carolina poplar (P. deltoidea, var. missouriensis); on the right, cuttings just set in tin; on the left, ready for planting out.

(b) Cuttings in tins under partial shade.

and should again be shaded for a short period. If planting out is neglected now, the cuttings will die off in the case of those in tins, as the poor soil or sand is not sufficient to nourish the growth which has been established from within the tissues of the cutting.

In the case of cuttings planted in lines, they should be similarly transplanted.

Those planted *in situ* will penetrate with their roots into the soil beyond.

Suitable Species.—In Southern Rhodesia eucalypts, pines and many other conifers and acacias are not raised from cuttings. The following list, by no means exhaustive, gives a number of species which may be:—

Trees.—Carolina poplar, willows, mulberry, catalpa, tamarisk.

Shrubs.—Thuya orientalis, oleander, privet, pomegranate, poinsettia, quince, may, hibiscus, rhus, beaumontia, bougainvillea, bignonia, frangipani, holmskioldia, buddleia, moonflower, grape vine, roses, etc.

From the above it will be seen that ornamental shrubs are more concerned than forest trees. A number of indigenous trees and shrubs can also be propagated by cuttings.

Softwood Cuttings.—By a softwood cutting is meant a green terminal shoot with the growing point allowed to remain. It may be from 2 to 4 inches long. In regard to condition of the tissue, the stem when tested must be capable of breaking sharply. In the case of these cuttings also the leaf surface must be reduced. Softwood cuttings require the same treatment as hardwood, but considerably more care. They must be more protected against extremes of any sort and particularly of temperature. Softwood cuttings are usually only employed in the cases of plants which prove too difficult by other methods—a good example is the brick-red bougainvillea.

Layering.—This method also is usually only employed in cases where the more usual ones fail. It consists of making a cutting only partially severed from the parent stem. An oblique cut is made half way through the underside of the branch below a bud; in this way life is maintained while

callus growth is formed. If necessary a piece of stick or a stone is inserted to keep the cut open. The branch is then pegged down into the ground at the cut; and the point of it is left above ground, and kept so until roots have formed, when it is severed from the parent stock and transplanted.

From the description of the method it is obvious that lower branches should be chosen for treatment. If for any reason this is not possible, the higher branches may be employed and layered in soil in tins, bags, etc., attached to the branch.

Examples of plants which may be propagated by layering are garden fig, naartje, brick-red bougainvillea, beaumontia, etc.

Truncheon Cuttings.—These are cuttings which correspond entirely as regards treatment with ordinary hardwood cuttings. They are much more rarely employed. Such cuttings may be up to 4 inches or more in diameter and of varying length. The method gives very strong bushy plants, and to this extent is an advantage; but it is too cumbersome for general employment.

Suckers.—In some plants, a good example of which is the white poplar (*Populus alba*), the underground branches, *i.e.*, the roots, send up shoots from their dormant buds. Thus a ready rooted cutting is obtained by the simple operation of severing the sucker from the parent root. The better aerated the roots are, the better is the sucker growth. Thus the soil between the trees should be cultivated, and even slight injury to the lateral roots is beneficial rather than otherwise.

Live Fences.—Fences of which the standards are live poles are less liable to fire damage. To establish this, after felling trim the poles neatly of their branch and leaf growth, taking care not to injure the bark. Plant the poles in big square holes with well pulverised soil thoroughly firmed down all round. Replace any blanks that occur. The poles may either be planted a year or so before erection of the fence, or may be evenly spaced between the dead (wood or iron) standards of an existing fence. When the live poles strike, the other standards can then be removed.

Many indigenous trees furnish large truncheon cuttings suitable for live fence poles.

Examples of these are:—*Kirkia acuminata* (m'shumina), *Pterocarpus erinaceus* (mukwa, bloodwood), *Erythrina* (kaffir boom), *Lannea discolor*, *Cussonia* sp. (m'fengi, cabbage tree), *Ekebergia* sp., *Commiphora* sp., *Ficus* sp. (fig) and others. Exotic species which may be so used are poplars, willows and mulberry.

Conclusion.—If the simple and fundamental rules for raising plants from cuttings are observed, results will be found to be sure and satisfactory.

Select suitable growth from the parent plant.

Make clean cuts above and below buds.

"Set" without delay.

"Set" without injury to bark.

Pure sand is best.

Keep moist.

Keep evenly shaded from extremes of temperature, so that the soil may remain warm.

CORRECTION.

Page 1142, first line, December issue, delete "1d. each."

Domestic Water Supplies and Sanitation on the Farm.

(Continued.)

By P. H. HAVILAND, B.Sc. (Eng.),
Assistant Irrigation Engineer.

Gravitation Schemes.—Water may be obtained by gravitation from streams or rivers and from springs. Should a river be the source of supply, some means of diversion is necessary, and the most suitable is a masonry or concrete weir. The design and construction of these is fully dealt with in "Weirs and their Construction," obtainable as Bulletin No. 452. Water may be carried either in an open channel or in pipes, but the only advantage of the former method is its cheapness, and from every other point of view it is to be condemned. It is a practical impossibility to prevent pollution occurring, no matter what steps may be taken, and an expensive system of purification would have to be installed in order to render the water safe for drinking.

Piping should always be installed in spite of the higher expense. Piping is made of various materials, but for use in small schemes in this country wrought-iron is undoubtedly the best. This may be obtained as plain or black, or else galvanised, and the latter type is the better to instal. The cost is slightly more than black piping, but its useful life is much longer on account of the galvanised covering. Galvanised wrought-iron pipes are generally jointed together by means of screw couplings or sockets.

In laying a pipe line, the ideal location would be in a straight line and on one continuous uniform grade from the inlet to the outlet. Such a location is said to be on the "hydraulic gradient," and would be that requiring the shortest length of piping with the consequent smallest friction

loss (see Figure IV.). Unfortunately, this is never possible in practice, but every endeavour must always be made to adhere to the hydraulic gradient as closely as the surface of the ground will permit, and *never*, unless it is absolutely unavoidable, allow the location of the pipe line to rise above the hydraulic gradient, although it may be permitted to fall below.

The reason for not allowing the pipe line to rise above the hydraulic gradient line is that when below the pressure in the pipe is greater than atmospheric pressure, and if above it is less. If the latter condition holds, a certain quantity of the air held in the water is released, and any leakage of air possible at the joints will take place, the air being drawn into the pipe line. This air will collect at the high point in the pipe line, and even if it does not result in complete stoppage of flow will reduce the quantity of water passing through. If it is impossible to set the pipe line below the hydraulic gradient, air valves must be placed at the high points. These valves are of two types, automatic or hand operated. The former are somewhat expensive, and on small schemes the latter will usually be found quite effective. Should the pipe line rise above hydraulic grade, a height exceeding about 30 feet at sea level and less at higher altitudes, no flow will take place at all.

It is advisable to place air valves at all summits along the pipe line, even where these fall below hydraulic gradient, as there is a tendency for air to collect there, although it is not so pronounced as when summit occurs above gradient. Figure IV. shows two pipe line locations in section. Location A, B, C, D, E has a summit above hydraulic gradient, and an air valve must be placed at C. On location A, F, G, H, J, K, E air valves should be placed at G and J, although the accumulation of air at these points will not be as great as at C in the other location.

Flowing water always carries with it a certain amount of solid matter, and in a pipe line this tends to be deposited at the low points. In consequence scour valves should be placed at such positions. In Figure IV. scour valves should be placed at B and at F, H and K. A scour valve will not be necessary at D, as the pipe line beyond merely flattens out in grade and does not actually rise in elevation above D.

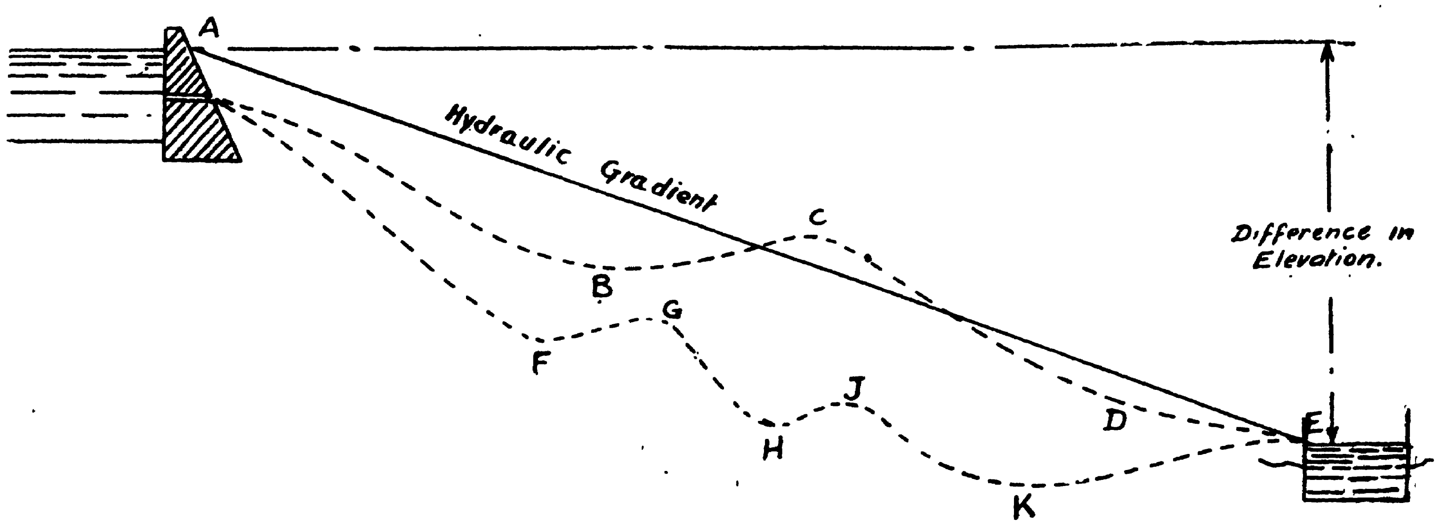


Fig. IV.

Scour valves may be simply constructed out of a tee piece, a short length of pipe and a full way stop valve. This arrangement is shown in Figure V. The short length of pipe serves to collect the sediment, and on opening the valve it is scoured out. Scour valves should be placed vertically below the pipe line. All valves along the pipe line should be protected by small brick in cement, masonry or concrete boxes with locked covers.

Pipe lines must, wherever possible, be laid below the ground at a depth of not less than 12 inches. In the case of pipe lines crossing cultivated lands they must be buried sufficiently deep to avoid their being fouled by ploughs or other agricultural implements. The reason for burying piping below ground level is in order to obtain as uniform a temperature as possible. Large changes in temperature cause expansion and contraction in the piping, and buckling or complete failure may result. In this country where the range of temperature is great, varying in many localities from 40 degrees to 120 degrees Fahrenheit in 12 hours, expansion and contraction is a serious matter. By setting piping underground the necessity for installing expansion joints is usually dispensed with.

On any pipe line sharp bends must be avoided. The straightest route should be adopted, and where bends must be put in the curvature must be gradual. Every curve reduces the capacity of the pipe line by causing extra friction. When filling in the trench after piping has been laid, care must be taken to see that the softer material is replaced first to avoid damage to the piping. When streams or depressions which may carry storm water have to be crossed, due protection must be given. This is best done by setting the pipe in concrete or running it through a masonry conduit. Where piping is carried above small, deep depressions, it must be well wrapped with straw and packing. The inlet end of the pipe line should be bell-mouthed and should be enclosed in a concrete or masonry box. This box should have a vertical screen in one side of it to prevent sticks and debris from entering the pipe line. The screen may be set slightly forward, and is best constructed of copper to reduce corrosion. The screen should be of fairly coarse mesh, otherwise clogging will result very easily. After

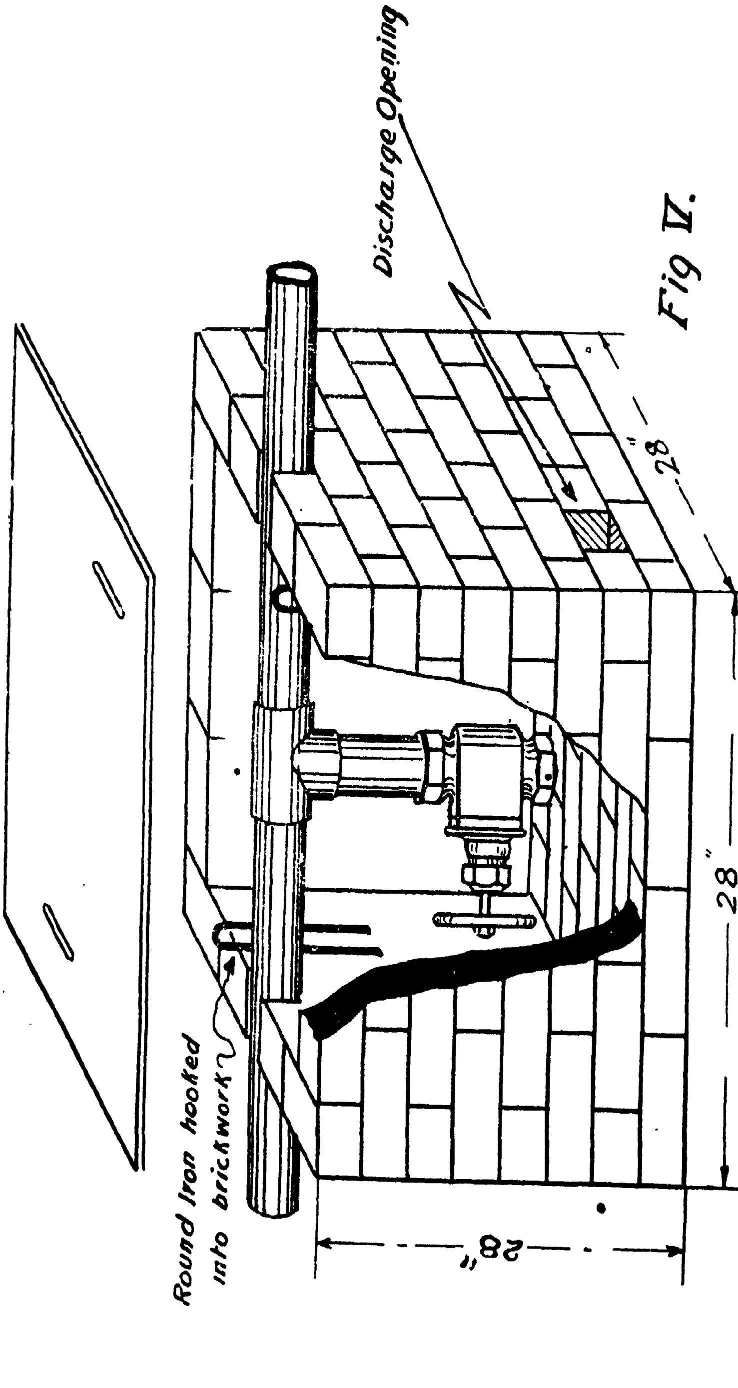

Discharge Opening
28"
28"
28"
Round Iron hooked
into brickwork

Fig V.

laying and before back filling the trench the whole pipe line should be tested in order that any leaking joints may be discovered. It is advisable at the same time to test all valves and fittings.

The carrying capacity of any pipe depends on the slope of the hydraulic gradient, length of pipe line and velocity of flow. The velocity of flow is intimately connected with the state of the pipe surface, whether rough or smooth, number and sharpness of bends, valves and other fittings, as all these increase the friction which is attendant on motion. As the formula used for calculating pipe discharges has in it a variable co-efficient, it will not be possible to give any simple method by which a farmer could arrive at the correct size of pipe to instal. The following table, however, gives pipe discharges which are sufficiently correct for practical purposes. Any further information required as to pipe discharges may be obtained by writing to the Government Irrigation Engineer. The length of pipe line and difference in elevation between inlet and outlet must be given, and also either quantity of water required to be delivered or else size of pipe being installed. The grade shown in the table is the total length of the pipe line in feet divided by the difference in elevation between inlet and outlet in feet. The discharges are given for moderately old pipes. When piping is new and clean the discharge will be greater, but provision must be made for the time when the pipes become encrusted and corroded by the mineral salts carried in water. It would be unwise to instal piping which when new would carry not more than the maximum requirements.

PIPE DISCHARGES.

Gallons per minute.

Pipe line grade.	Inside diameter of pipe in inches.										
	¾	1	1¼	1½	1¾	2	2½	3	3½	4	5
1 in 100	¾	2	3½	5¾	8½	12	22½	36	54	80	145
,, 200	...	1¼	2¼	3¾	5¾	8	15	24	37	54	100
,, 300	...	1	1¾	3	4½	6¼	12	19	29	42	80
,, 500	...	½	1¼	2¼	3¼	4¾	9	14½	22	32	58
,, 700	...	...	1	1¾	2¾	3¾	7½	12	18	26	48
,, 1,000	...	...	¾	1½	2¼	3	6	9½	14½	21	39
,, 1,500	...	...	...	1¼	1¾	2½	4¾	7½	12	17	31
,, 2,000	...	...	...	1	1½	2	4	6½	10	14	26
,, 3,000	...	...	...	½	1¼	1¾	3¼	5	7¾	11	21

An example will show how use may be made of the tables:—Total requirements in 24 hours are 2,100 gallons, which is approximately 1½ gallons per minute. The difference in elevation between the inlet and outlet of the pipe line is 2½ feet, and the total length of the pipe line is 5,000 feet. The grade will therefore be 1 in $\frac{5{,}000}{2\frac{1}{2}}$ = 1 in 2,000.

Following the 1 in 2,000 grade line in the table as far as 1½ gallons per minute discharge, and then going to the top of the column in which the 1½ appears, it is found that the diameter of the pipe required is 1¾ inches.

Another example of the use of the tables: A line of 2½ inch diameter piping has been laid on a grade of 1 in 400; how much water will be discharged in 12 hours? The grade of 1 in 400 lies between 1 in 300 and 1 in 500. Follow along the 1 in 300 grade line as far as the 2½ inch diameter column, and the discharge is given as 12 gallons per minute. Similarly a grade of 1 in 500 gives a discharge of 9 gallons per minute. A grade of 1 in 400 will give a discharge approximately between 9 and 12, that is 10½ gallons per

minute. The discharge in 12 hours will therefore be $10\frac{1}{2}$ multiplied by 60 multiplied by 12=7,560 gallons.

Pumping Schemes.—Owing to the depth of most water supplies in this country pumping usually has to be resorted to, and in this connection the chief factor to be considered is the most economical and efficient prime mover or engine to instal. Power may be obtained from water, wind, steam or the expansion of gases, and various kinds of engines are employed which make use of these.

Horse Power.—The power necessary to perform the work required must be found before any particular type of engine can be decided on.

A horse power is a unit of measure of the energy expended in doing a definite amount of work. One horse power is defined as 33,000 foot-pounds of work per minute. This may be explained as the energy required to raise 33,000 pounds through a height of 1 foot in 1 minute.

The same amount of energy would be expended in raising 33 pounds to a height of 1,000 feet in 1 minute, or in raising 33 pounds to a height of 100 feet in 1-10th of a minute.

In makers' catalogues the terms Indicated Horse Power (I.H.P.), Nominal Horse Power (N.H.P.), and Brake Horse Power (B.H.P.) often appear, and an explanation of these terms will be useful.

Indicated Horse Power is the theoretical horse power, and includes that necessary to drive the engine itself. Nominal Horse Power is, as its name implies, merely nominal, and is less than Brake Horse Power, very often being about a half to a third for portable steam engines. Brake Horse Power is the actual power available at the engine for driving other machinery.

When any machinery is driven a certain amount of work has to be performed in overcoming the frictional resistance in the moving parts of the machine, and the frictional resistance to be overcome controls the efficiency of any plant. Pumping plants, consisting of the prime mover or engine and machinery such as pumps, have efficiencies varying from 25 to 75 per cent., which means that the actual or brake horse power required in the prime mover will have to be considerably greater than the theoretical power required to

raise water. An average efficiency of 40 per cent. may be assumed for purposes of calculation. The following formula may be used to find the horse power necessary for raising water:—

Brake horse power $= \frac{Q \times H}{79{,}200}$ where Q is the number of gallons of water pumped per hour and H is the height in feet the water is raised. H is measured from the lowest water level from which pumping takes place up to the highest point of delivery.

The formula may be expressed thus: Multiply gallons per hour by height in feet and divide the result by 79,200.

The approximate brake horse power having been ascertained in this way, the type of engine may be decided upon. If it is proposed to use a pumping plant for domestic water supplies and for irrigation, it should be noted that a 3-inch watering on an acre, which is the usual amount of water applied at any one time, amounts to 60,000 gallons.

Water Power.—The most economic machine to instal and run is the hydraulic ram. A general description of rams and the method in which they operate appeared in the *Rhodesia Agricultural Journal* of February, 1920, and is also available in bulletin form. Rams of different sizes will operate with large ranges of flows varying from 1½ gallons to 1,800 gallons per minute, and with working falls from 1½ to 100 feet, although it is not advisable to make use of working falls of much over 20 feet, owing to the wear and tear of the valves. In general the efficiency of a ram varies as the ratio of the lift to the working fall varies. The percentage lifted of water supplied to the ram is shown in the table below.*

* *S.A. Journal of Industries*, p. 136, February, 1919.

TABLE.

Ratio of lift to fall ...	$\frac{H}{h}$	$\frac{3}{1}$	$\frac{5}{1}$	$\frac{8}{1}$	$\frac{10}{1}$	$\frac{15}{1}$	$\frac{20}{1}$
Efficiency, per cent. ...	...	77	67	55	48	34	22
Percentage lifted of water supplied to ram ...	...	25	13	6	5	2	1

If H is the height to which the water is raised above the ram, and h is the working fall, the ratio referred to above will be $\frac{H}{h}$. Suppose the lift were 56 feet and the working fall 7 feet, the ratio would be $\frac{56}{7}$ or $\frac{8}{1}$ and the efficiency would be 55 per cent. and the percentage lifted of water supplied would be about 6 per cent. That is, for every 100 gallons used to operate the ram, 6 gallons would be raised to a height of 56 feet.

The maintenance costs of a ram are negligible, and an occasional overhaul is all that is necessary. Attendance is not required and the ram will operate day and night. A ram will not operate under water, however, and consequently, in investigating the working fall available, due regard must be had to the maximum flood levels in streams in order that operation may continue as long as possible. A ram is started and stopped by opening and shutting off the supply water. Good foundations are necessary for rams. The drive or operating pipe is usually of a length equivalent to seven times the working fall. Water may be conveyed in an open canal as far as the drive pipe. One type of ram now on the market will raise clean water from one source while it is operated by dirty water from another source.

Other water-operated machines are water wheels and turbines. The difference between a water wheel and a turbine is that in the former water is admitted to the wheel at one point only at any one time, and in the latter water is admitted simultaneously to all points on its circumference.

There are four types of water wheels—overshot, undershot, breast and Pelton wheels. In general, water wheels, except the Pelton, are suitable only for small powers and low heads or falls and where close speed regulation is not necessary. The water wheel is of great size and weight and has a low rotative speed. Consequently, if machinery has to be driven at high speeds it necessitates the use of large gears with resulting increase in friction. Against these disadvantages there are the comparatively low cost of the wheel, cheap repairs, inexpensive housing and simple construction. For pumping purposes, however, a water wheel can be used as shown in Figure VI. In the overshot wheel, water is supplied near the highest point of the circumference to a series of buckets round the circumference. The buckets are formed by vanes between two circular shrouds, the bottoms of the buckets being formed by the inside circumference of the wheel. Figure VI. shows the general arrangement. Two types of vanes are shown—angular and curved. The curved type gives a greater efficiency, but is a little more expensive to construct. In the undershot and breast wheel, water is supplied at the lowest and at some point in the breast respectively.

The Pelton wheel is suitable for small flows and big falls and will prove very economical for a combination of pumping and generation of electric power, the latter being used for the supply of light and the operation of agricultural machinery. The Pelton wheel is capable of high rotative speed, and great speed variation is possible with very little loss of efficiency. A Pelton wheel is not recommended for falls of less than 30 feet. For falls above 50 feet the Pelton wheel cannot be surpassed in efficiency by any other form of hydraulic motor.

The horse power obtainable from falling water is given approximately by the formula $\frac{q \times h}{4.500}$ where q is the quantity of operating water in gallons per minute and h is the available fall measured down to the level where the water leaves the wheel.

Turbines as a rule are too expensive to be utilised for pumping purposes and will not be discussed.

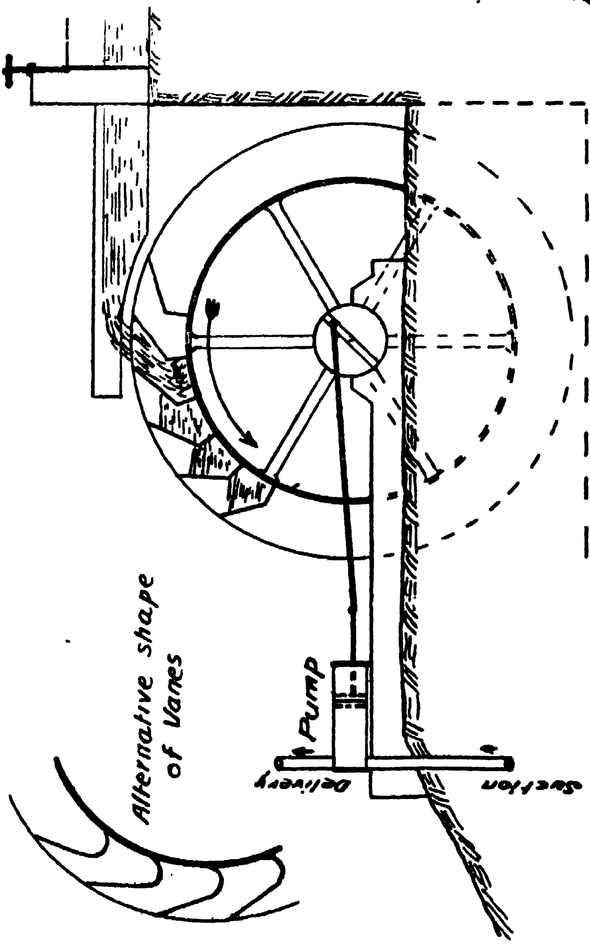


Fig. VI.

Wind Power.—A windmill will be found to be a most satisfactory power unit for small water supplies where wind is fairly regular and when the pumping lift is not too great. The running costs are negligible, consisting only of a small quantity of lubricating oil and the expense of an occasional overhaul. Many makes of windmills are on the market, and the majority of these are very satisfactory. The enclosed oil bath type of mill is probably the best, as when once filled with oil it is capable of running for a considerable period without attention. It is, however, not advisable to leave the inspection of a windmill for too long a period. Windmills are usually stocked in sizes varying from eight feet to sixteen feet diameter. The correct size to adopt depends on the total lift necessary. This total lift is measured from the lowest water level to the highest point of delivery, the latter being usually a tank or reservoir.

The following table* gives maximum lifts suitable for different sizes of mill:—

Diameter of mill.	Total lift.
8 feet	106
10 feet	158
12 feet	250
14 feet	375
16 feet	450

When maximum lifts are used the cylinder should not be greater than 2-inch diameter, but where the lift is less the cylinder may be correspondingly greater, thus enabling a larger quantity of water to be delivered. As an example, a 10-feet diameter windmill with a 2-inch cylinder and a lift of 158 feet is capable of delivering 109 gallons per hour in a light wind and 163 gallons in a wind of 15 miles per hour. The same mill, with a lift of 74 feet and a 3-inch cylinder, will deliver under the above wind conditions 248 and 372 gallons per hour respectively.*

Commercial firms who supply windmills will always give details as to the most suitable size of mill and cylinder to instal in any particular case.

In investigating the installation of a windmill, the height of tower must be considered. The height is controlled by trees, buildings and other wind-diverting obstacles in

* Stewarts and Lloyds (South Africa), Ltd.

Fig. VII.
Animal pumping gear.

the immediate vicinity. The tower should be sufficiently high to clear any obstacles which are within 400 feet of it. The velocity of wind depends on the frictional resistance opposing the movement, and as an increase in wind velocity gives increased power, it will be found better to instal a small wheel on a high tower in preference to a larger wheel on a low tower.

A point to be borne in mind in considering windmills is that wind is intermittent in occurrence and as a general rule can be relied upon for only one-third of the time. It will therefore be necessary to provide storage for, say, a three-days' supply—or better, storage sufficient to take four to seven days' windmill delivery. If daily requirements are 800 gallons, storage should be provided for at least a three days' supply of 2,400 gallons, and the pumping rate to be allowed for should be 100 gallons per hour.

Animal Power.—Animal power may be made use of by means of the "Noria" or "Bakkies" pump, which consists of an endless revolving chain of buckets operated through gearing, but it is not a very satisfactory method of raising water, and can be used only for lifts not exceeding 10 feet.

A more satisfactory way is to instal a piston pump operated by some form of animal operated gear, such as is shown in Figure VII.* The cost of such a gear is approximately £70, f.o.r. Salisbury. This type of gear can very conveniently be installed in localities where small supplies are required and where wind conditions are unfavourable for the use of the windmills. This gear will raise about 550 gallons per hour against a head of 50 to 60 feet, and 350 gallons per hour against a head of 90 to 100 feet, the number of strokes per minute being 25.

Steam Engines.—Small steam plants, although comparatively inexpensive in first cost and maintenance, are usually costly to run. The conditions which go to make pumping by steam economical are a plentiful and convenient supply of good wood and the use of the engine, which must be of the portable type, for other work on the farm. Should fuel have to be purchased, pumping by a steam engine will be found expensive. The costs of running are made up of continual attendance, loss of time in raising steam, fuel

* By permission of Messrs. Stewarts and Lloyds (South Africa), Ltd.

and lubrication. Great care must be taken to keep the boiler clean, and water containing a high percentage of mineral salts should be avoided.

Internal Combustion Engines.—The most suitable types of internal combustion engines to use for water supplies on the farm are the petrol-paraffin oil engine and the gas engine. Up to about 5 h.p. the most economical to adopt is the petrol-paraffin engine. This type uses paraffin as the motive fluid, but is usually started with petrol, on which it runs for the first minute or two. The consumption of paraffin for the small sizes is approximately one pint per brake horse power per hour, and for the larger sizes the consumption is somewhat less. These engines are obtainable as portable on wheels, semi-portable on skids and stationary, and are suitable for driving any agricultural machinery. They require very little attendance once started, and are fairly simple in design. The cost of fuel prevents the larger sizes being used economically.

From about 7 h.p. a suction gas plant will probably be the cheapest to run. These are fairly high in cost per horse power for small sizes, but this cost per horse power is reduced considerably as the size of engine increases. Suction gas is a very efficient fuel, and the producer installed may be either of the charcoal or refuse-burning type. The former is more suitable for small plants, the latter being installed for engine sizes of about 12 h.p. and upwards. When ordering gas or oil engines they must be ordered to develop the requisite brake horse power at the *altitude* of the place at which they will be installed. The reason for this is that there is a considerable reduction in power at altitudes above sea level.

Refuse-burning producers will burn wood blocks or chips, cotton seed, mealie cobs and similar fuels. The consumption of charcoal in the charcoal-burning type for small sizes is about 1¼ lbs. per brake horse power per hour. In larger engines the consumption is slightly less.

It is advisable whenever possible to run the engine at full load, as the efficiency is then at its greatest and the fuel consumption at its minimum. In most engine-pumping installations a power head will be required. These consist usually of a simple reduction gearing, enabling the engine

to run at fairly high speed while the pump plunger operates at about 30 strokes per minute. In selecting a suitable power head it will generally be found that the heavier patterns are the most suitable, but regard must be had to the depth from which pumping takes place. There is at the present time a combined engine and power head on the market, and for small lifts this will be found quite satisfactory. The fuel is paraffin oil.

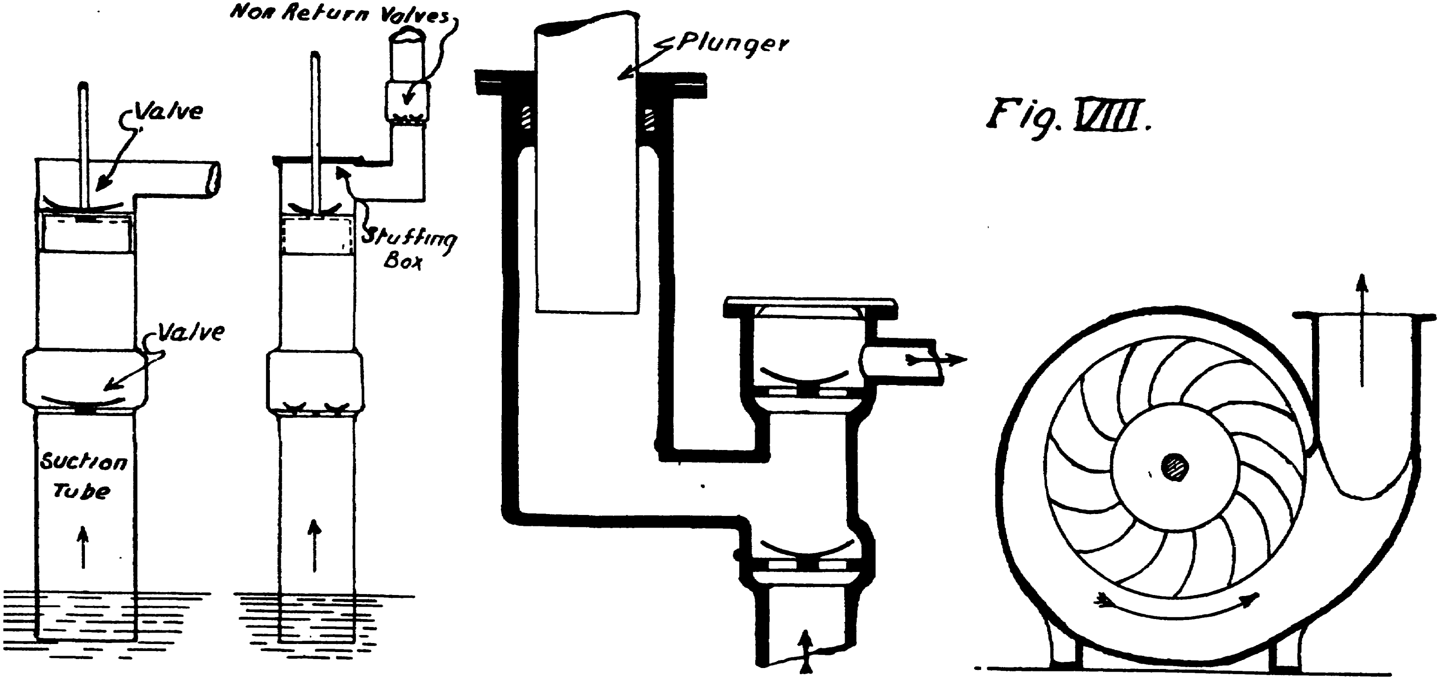
Pumps.—The types of pumps obtainable are so wide in variation of design that it will not be possible to describe all, but a general description of those suited to small water supplies will be given. For this purpose pumps may be divided into three classes:—

(a) Scoop.
(b) Plunger or reciprocating.
(c) Rotary.

Scoop Pumps.—These are adaptations of the earliest form of pump known. Usually a scoop pump consists of either a wheel with vanes attached round its circumference or else an endless chain of buckets. The most usual form of the latter is the "Noria" or "Bakkies" pump, operated by animal power. Scoop pumps are suited to very low lifts only, certainly not above about 10 feet.

Plunger or Reciprocating Pumps.—The action of a pump may be divided into two stages—suction, and lift or force. If all the air were exhausted from a pipe and a perfect vacuum formed, at sea level water would rise in the pipe to a height of 34 feet. This is due to atmospheric pressure. As this pressure decreases with an increase in altitude, the height to which water will rise will be less. This height is known as the suction lift. In practice the suction lift is less than the theoretical, being for 5,000 feet altitude not greater than 18 feet. The first action of a pump is to exhaust air, and a whole or partial vacuum is formed in the suction tube below the pump, with the result that the water rises in the pipe. The pump then lifts or forces the water up to the desired height. Below the suction tube a foot-valve and strainer should be placed. The object of the foot-valve is to enable the suction tube to be kept full of water the whole time. In the lift type of pump the cylinder is provided with a valve at the bottom, which

Fig. VIII.



BUCKET PUMP

FORCE PUMP

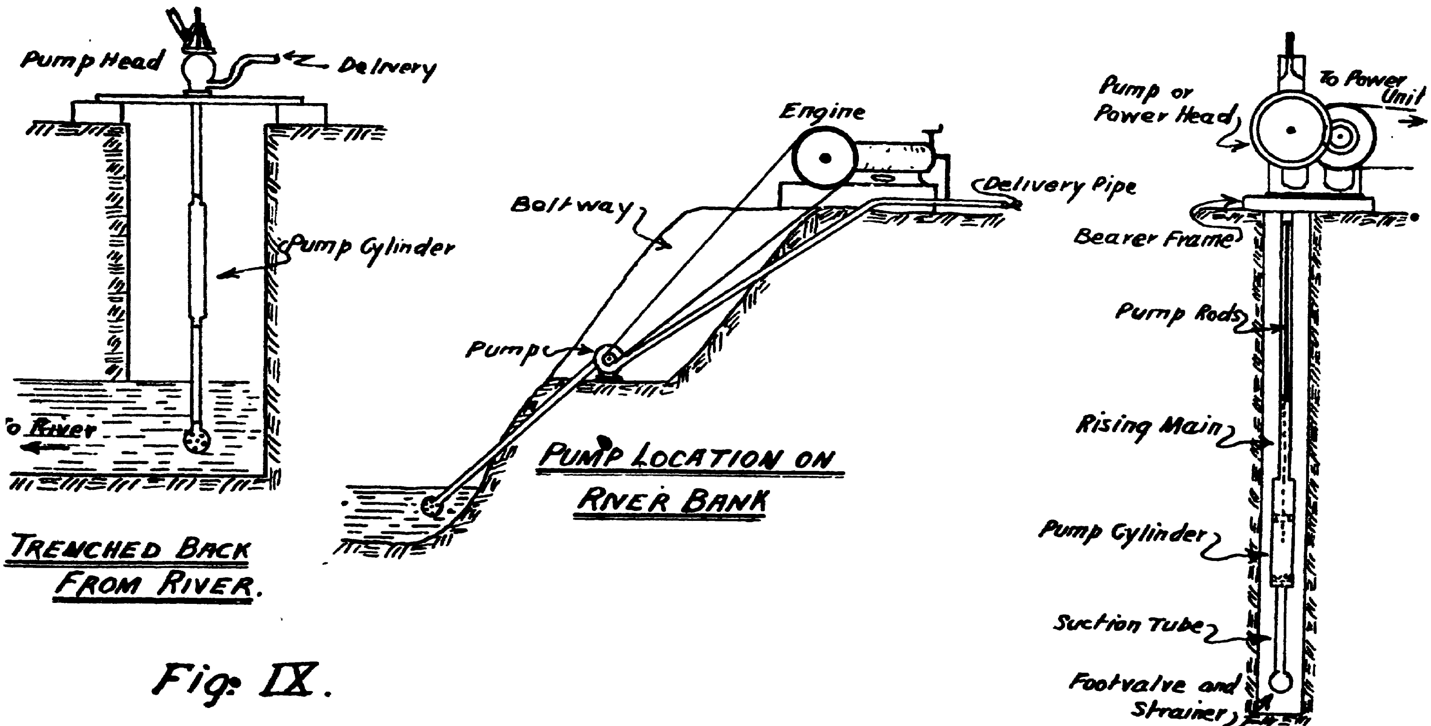
PLUNGER PUMP

CENTRIFUGAL PUMP.

opens upwards. On the up stroke of the pump this valve opens, and immediately at the commencement of the downward stroke the valve is closed by the weight of water above it. A second valve is contained in the pump, operating in a similar way, but closing on the up stroke. Figure VIII. shows a diagrammatic sketch of this bucket or lift type. By the addition of a closed top with a stuffing box, through which the pump rod passes, and a set of non-return valves on the delivery side of the pump, it becomes a force pump. The deep well or borehole cylinder pump is of this type. Another modification is the adoption of a plunger in place of the bucket, and a plunger pump results. This is also shown in Figure VIII. Reciprocating pumps are supplied as single acting—that is, working on one stroke only—or double acting, when work is done on both the upward and downward strokes. Where a large delivery is required, and where the diameter of a borehole is too small to allow of a large diameter cylinder being placed and it is not desirable to have too long a stroke, a double acting cylinder may be installed. This will deliver about 50 per cent. more water per stroke than a single acting cylinder, the power required being, of course, greater. The semi-rotary or wing pump is a link between reciprocating and centrifugal pumps. This type is a hand pump and is suitable for lifts up to about 80 feet. It is manufactured to deliver large volumes of water. It will not draw below 18 feet lower than the pump itself.

TABLE OF CAPACITIES OF WELL OR BOREHOLE PUMP CYLINDERS.

Inside diameter of cylinder. (Inches.)	Length of stroke. (Inches.)	Capacity per stroke. (Gallons.)
2	12	.136
2	16	.181
2½	12	.212
2½	16	.283
3	12	.306
3	16	.408
3½	12	.413
3½	16	.551
4	12	.544
4	16	.725



TRENCHED BACK FROM RIVER.

PUMP LOCATION ON RIVER BANK

WELL EQUIPMENT.

Fig. IX.

Centrifugal Pumps.—This pump is in its essentials a reversed water turbine. It is suited to large volumes of water being delivered continuously, but has the disadvantage that it cannot be fixed at any great height above the water to be lifted. This height is limited to about 10 feet. The force lift for best working is as a rule small, being limited to about 50 feet, but deliveries to greater heights can be obtained by pumps of special construction. A diagrammatic sketch of this type of pump is shown in Figure VIII.

Location of Pumps.—As regards the location of pumps in wells and boreholes, the only precautions to be taken are to see that the pump is placed sufficiently far down to allow of water being raised when the water table is at its lowest, and to keep the foot-valve as far above the bottom of the well as possible. This latter precaution is to avoid sand and sediment being pumped up.

In pumping from a river a deep pool with rock bottom is the best suited for pump location. Trenching back from the river is to be recommended as a means of keeping the engine, etc., away from the reach of floods. Another method is to set the engine as high up as possible and utilise a long belt driving down to the pump, which may be left below top flood level. These two locations are shown in Figure IX.

Borehole or Well Equipment.—The general pumping equipment for a well or borehole consists of a foot-valve and strainer, suction tube, pump cylinder, rising main and pump rods, bearer frame, pump head and power unit (Figure IX.).

(*To be concluded.*)

Ducks on the Farm.

(*Revised.*)

By H. G. Wheeldon, Assistant Poultry Expert.

Of the many profitable undertakings in connection with the poultry industry the one which can be regarded as the most profitable next to the "raising of pullets for egg production" is the production of table ducks.

Although within recent years the raising of ducks in Rhodesia has received some attention and is a profitable source of income to many breeders, it is still a somewhat neglected branch of the industry. It is certainly capable of greater development and is a remunerative business when carried out under modern methods of hatching and rearing, and provided the work is undertaken in close proximity to the markets.

Ducks are one of the quickest maturing birds we have. They are easy to rear, and for young fat ducks about ten weeks old there is a good demand. At this age the flesh is tender and juicy and realises a comparatively high price. Up to this period also the flesh is more economically produced, and all ducks intended for table purposes should be sold at this age. Ducks are considered to be the hardiest of the inmates of the poultry yard, since the loss of ducklings need not be more than from 2 to 5 per cent. They are very seldom subject to disease or insect vermin, they are easy to control in runs, and the equipment required is neither extensive nor expensive. It will therefore be realised that there is money in raising ducks for anyone who will make an intelligent effort to secure it.

The farmer can feed ducks at a minimum cost, as one-third of the bulk of food for breeding ducks may largely consist of waste vegetable leaves or other green vegetation which

the farmer may sort out from his vegetable garden and on which he places but little value. If the farmer is a dairyman, the skim-milk fed to stock ducks furnishes the best of nourishment at little cost, and if fed to growing ducklings will produce twice or three times the value it would if fed to many other classes of farm stock. There is always a demand for well fattened ducks, and a simple advertisement that they can be secured is all that is necessary for their disposal. Duck eggs are not in as great demand, except for cooking purposes, as they should be, considering that their food value is as great as hens' eggs. They are a trifle richer and perhaps slightly less digestible, but still, they should be in greater demand than they are.

Breeds.—There are quite a number of wild and domesticated breeds of ducks. The best known of the latter are the Aylesbury, Pekin, Rouen, Indian Runner and Muscovy. Another breed which is gaining in popularity is the Khaki-Campbell. Other varieties are the Buff and Blue Orpington, Cayuga and the Crested Duck.

The Aylesbury is a fine white bird, with a long, broad, deep body carried horizontally—the keel practically parallel with the ground—with light-coloured bill and bright orange shanks and feet. The flesh is solid and white. The Aylesbury is essentially a table duck and matures very quickly, and the ducklings if properly fed and cared for will weigh 5 lbs. to 6 lbs. in ten weeks. This breed is the favourite in England. Standard weights: drake, 10 lbs.; duck, 9 lbs.

The Pekin.—This is the favourite American breed both for utility and exhibition purposes. It is not quite so long in body as the Aylesbury, and the carriage is more upright. It is white in plumage, tinged yellow or cream. The flesh is yellowish with a delicate flavour. The bill, shanks and feet are bright orange in colour. Eyes dark lead-blue. Standard weights: drake, 9 lbs.; duck, 8 lbs. The Pekin is considered to be the best general-purpose breed of duck. It matures fairly quickly, but is more active and a better layer than the Aylesbury, and it is a non-sitter as a rule.

The Rouen is essentially an exhibition breed, and is the most beautiful breed of all domesticated ducks. The type, size and carriage are not unlike those of the Aylesbury. They are generally slightly heavier and more ungainly in move-

ment than the two previous breeds, and the skin is slightly dark in colour. In quality and colour of plumage it resembles the wild duck or mallard, except that this has been bred darker and richer. The eggs are somewhat small as a rule, and some strains are good layers. Standard weights: drake, 10 lbs.; duck, 9 lbs.

The Indian Runner is essentially kept for egg production, being a remarkably prolific layer of large, light-coloured eggs of good shape. The two best known varieties are the white and the fawn and white. The body is long, narrow and racy-looking, the carriage being very erect, somewhat after the form of a penguin. Indian Runners are hardy and the best foragers. They do well without swimming water and are easy to rear. The standard weight drake is 5½ lbs., and the duck 4 lbs. The weight of either sex should not exceed 5½ lbs. nor be less than 3½ lbs.

The Muscovy.—There are many of these in South Africa. They differ greatly from ordinary ducks in type and about the head. The colours vary from white with a black crest to black and black and white. The face is free from feathers and fleshy and bright red. The drake weighs about 10 lbs. and the flesh is medium dark in colour, but varies with the food they eat. They do not make good table ducks, and from a grower's point of view they are rather slow maturing; and the size of the drake as compared with the duck varies greatly, which is a disadvantage for marketing. They are good sitters and fairly prolific. One point about this variety is the fact that their eggs take five weeks to hatch as compared with four weeks in other varieties. Muscovies are also more difficult to control in runs.

The Campbell Duck is somewhat like the Rouen in appearance, but much lighter, with a plain head of a greyish-brown shade; the drakes have grey backs and a pale claret breast, and the legs are yellow. The original strain was descended from one duck which exhibited most remarkable laying powers, the object being to produce excellence in laying, with fair table qualities and quick maturity. They are not very large, stock birds weighing 4½ lbs. to 5 lbs., and in flavour they are said to considerably resemble the wild mallard, which was used in crossing as one of the foundations of the strain. The Khaki-Campbell is a sub-variety of this,

and of more recent production. The Indian Runner has been used in crossing to produce this variety, and as the result the Khaki-Campbell duck is of extremely active habits, doing best on free range and showing very little desire for swimming. At whatever time of the year they are hatched, they are said to commence laying at six months old and even sooner, so that by hatching three lots, very early, medium and late eggs may be obtained all the year round.

Buff Orpington Ducks were first brought into prominence in England in 1908, when they were shown at several large shows. In Australia they had previously made their reputation by winning two twelve months' laying competitions in succession. They are intended to fill the demand for a first-class layer, combined with good table qualities. They originated by mating Indian Runners to Aylesburys, Indian Runners to Rouens and Indian Runners to Cayugas. The above varieties were carefully bred and selected for three years for egg production alone, before the above crossing was done. The offspring of these matings were then crossed back and forth on to each other until with time, care and patience the desired end was accomplished. Many of the birds in the progeny showed a lot of blue in the plumage, and these were also carefully selected and mated with pure-bred Cayugas and Pekins, then the same process went on with these, mating and inter-mating until the Blue Orpington ducks were a finished article, the same as the Buff.

In South Africa there are many crosses of the Aylesbury and Pekin, and both being, as they are to the casual observer, white, they are therefore much alike. Their distinguishing characteristics are, however, well marked, as will be seen from the following:—

	The Aylesbury.	*The Pekin.*
Body ...	Deep and long ...	Short and deep
Colour of plumage	Pure white down to the skin	White, with canary-yellow tinge, especially under the wings
Head ...	Rather flat, and longer than that of the Pekin	Deep, rounded and short from front to back, and prominent forehead
Beak ...	Pinkish or flesh colour	Orange or yellow
Eyes ...	Dark	Dark lead-blue
Carriage ...	Horizontal ...	Upright

It will thus be seen that there are distinct differences in the two breeds, and duck raisers should note this when buying or selling stock.

Housing.—The housing of ducks is not a difficult matter and does not require much attention. An open wire fronted low-built shed on sloping ground will prove satisfactory; 5 ft. high in front and 4 ft. at the back, 15 ft. long and 10 ft. deep will accommodate 50 ducks. As ducks are very susceptible to rheumatism and cramp, it is most essential that the roof of the house be water-tight and free from leakages. The floor inside should be well elevated above the surrounding ground, and this should be hard, preferably made of cement, sloping gradually from back to front of the house, well littered and kept dry and clean by frequently renewing the litter. Wooden and earth floors are the least desirable, as they quickly become tainted and are difficult to keep dry and clean. The sides of the house need not necessarily extend to the roof; it is desirable to leave an opening three or four inches above the walls and below the roof for ventilation, as ducks like plenty of ventilation. Nest boxes are not required, as a duck often prefers to make its own nest on the floor. A few bricks may be provided, however, on the floor, if desired, for this purpose. A wire netting enclosure or run 3 ft. high should be provided, as it is advisable to keep the breeding and laying ducks from swimming water until 10 a.m. or 11 a.m. during the laying season, supplying them with drinking water only for this period, otherwise they are very liable to drop their eggs in the water, which generally means a loss. An enclosure 3 ft. high is ample to confine ducks. If possible, a running stream or water furrow through the yard would be a great convenience and save a lot of trouble as far as the water supply is concerned.

Selecting and Care of Breeders.—Vigour, quality and early maturity are the primary considerations in selecting breeding stock. Large birds are desirable, with good shape and a deep body. Medium size active birds are more satisfactory than larger ones, which may be coarse, and consequently take longer to put on flesh and fatten. The ducks which are to be kept as future breeders should be selected when six weeks old. At this age a careful selection should be made by picking out the more advanced and promising

ducklings, and these should be allowed free range and plenty of exercise to build up birds with vigour and with well-developed frames. Early hatched, fully developed young birds generally make the best breeders; preferably a vigorous drake twelve months old mated to two-year-old ducks.

The question of how many ducks to mate safely to a drake is governed to some extent by the water supply. Breeding ducks must have water to swim in, but not necessarily deep water, in order to make sure of getting fertile eggs, although "dry" rearing in the United States has produced strains that breed satisfactorily even if not allowed to swim, and some dry-reared ducks are found fertile in England. It is better, however, to supply the heavy breeds of ducks with swimming water. If a running stream or water furrow through the yard is not available, a small pond 6 ft. square and 1 ft. deep in each pen will suffice for a breeding pen of six birds. The sides and bottom of the pond should be lined with cement and the water renewed at least once a week, according to the season of the year. A breeding pen may consist of three, four or five ducks and one drake. In the event of there being an ample water supply and unlimited space, the breeding stock may be mated in the proportion of three drakes to twelve ducks at the commencement of the season, and as the weather becomes warmer the number of ducks may be increased to 18 or 20 with advantage. This system of mating applies more particularly to the duck farmer who raises ducklings for market. It is important that the male and females should not be too closely related if hardy, vigorous ducklings are required. Ducks may be bred from until they are three or four years old, and the drakes to be mated to ducks of this age should be preferably two years old.

The breeding stock should be mated up early in May. Before setting large numbers of eggs or sending out to customers, it is advisable to ascertain the fertility of the eggs. As a rule, the first eggs laid by young birds are apt to be unfertile, though if the birds are well cared for and fed, the fertility quickly improves. It is customary, therefore, to test the eggs in an incubator or under a hen until good fertility can be relied upon. Young ducks generally lay the earliest eggs in the season, and the older ones quickly come on as the spring advances and as the weather becomes warmer.

Feeding.—With reasonable care the feeding of stock ducks is not a difficult problem, provided the ducks are allowed ample exercise, either by foraging about or swimming, which prevents them from becoming too fat. Ducks are somewhat large eaters and readily put on fat, so that with swimming exercise and at the same time avoiding fattening foods to a reasonable extent the risk of an over-fatty condition of the birds may be reduced to a minimum. With good range, stock ducks do not require much feeding, as they would pick up a great deal in streams of water in the form of worms, grubs and weeds; in such circumstances a little mash in the morning and grain in the evening will suffice. It should be pointed out that ducks are gross feeders of vegetable and animal foods, even more so than fowls, and for best results these must at all times be supplied to them when kept in confinement or where they do not have access to streams of water. A deficiency of either of the above will put ducks off the lay. Another important item in the feeding of ducks is a liberal supply of oyster shell during the laying season. In this respect ducks might be termed artificial birds, for if oyster shell is withheld egg production may cease entirely, and young ducks six months old will very often delay in commencing to lay if not supplied with oyster shell or well slaked lime. Ducks must also be supplied with grit. If at any time it is necessary to change the diet, this should be done gradually, as any sudden change of food may affect the fertility of the eggs, or will interfere with the egg production. The mash should consist of—

2 parts wheaten bran;
1 part pollard;
½ part mealie meal;
1 part green food (chopped up);
5 per cent. to 10 per cent. animal food.

Moist mash should be given to ducks in shallow trays or troughs.

The best grain foods for stock ducks are wheat and oats; crushed mealies will prove satisfactory, however, provided the ducks are allowed plenty of exercise. The grain food should be thrown into a pond or shallow vessel of water. This method of feeding the grain is the most natural, and the ducks are able to pick it up and enjoy it. Oyster shell and grit may be given in the same way, which if thrown

into a pond will keep the ducks occupied in searching for it and at the same time it will induce exercise.

Incubation.—If duck eggs are slightly more difficult to incubate than hen eggs, the duck raiser has one consolation, in that ducklings are more easy to rear than chickens. Duck eggs intended for hatching should be carefully stored to prevent evaporation of the contents, and the fresher they are when set, the better. They may be set either under ducks, hens or in an incubator. Ducks, however, usually make indifferent sitters and worse mothers, and they are more difficult to control and handle than hens.

The conditions for the successful hatching of duck eggs are similar to those employed with hen eggs, except that duck eggs require a lower temperature, namely, 102 to 102½ degrees F. at the commencement, and after the second week a temperature of 103 to 103½ degrees F. would do no harm to the embryo ducklings. It should also be remembered that duck eggs require more moisture than hen eggs do. The egg shell of the former being thinner and more porous, evaporation of the contents is thus greater and more rapid in dry weather. It therefore becomes necessary to spray the floor of the incubator room with water, in addition to the moisture supplied in the water tray of the machine. When broody hens are used for hatching purposes, moisture can be supplied by digging a hole two or three feet deep and three feet in diameter where the nest is to be placed. Pour in four or five gallons of water and replace the soil, and when the hole is filled up make a concave depression in the loose soil and line it with clean straw or grass; the nest is then ready for the eggs. The warmth from the body of the hen will draw up the moisture from below the nest; beyond this, the eggs will not require additional moisture unless the weather be very dry and windy, when the eggs may require sprinkling with tepid water during the last week of incubation. The incubation period of duck eggs is 28 days, during which time the eggs should be tested twice, namely, on the fifth or sixth day, and again on the tenth or twelfth day of incubation.

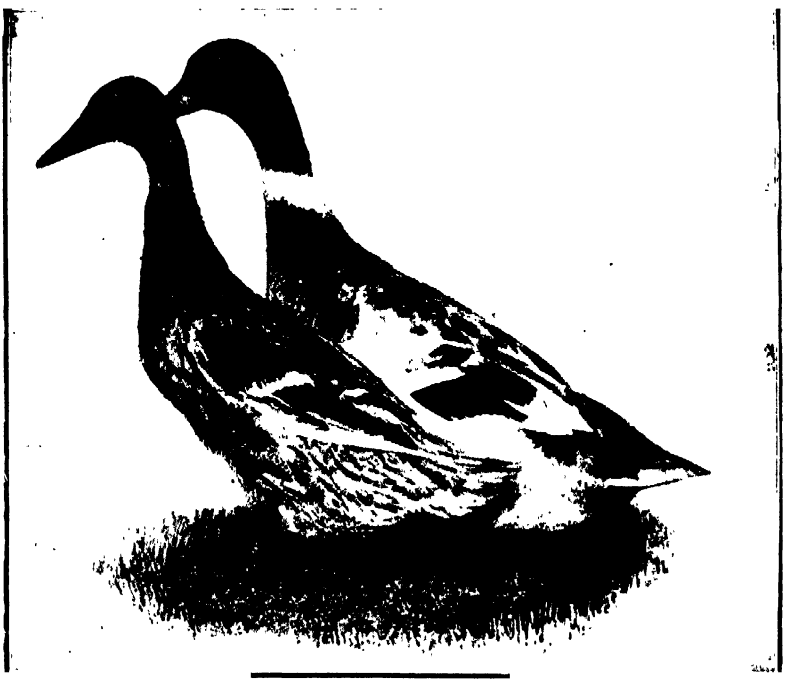
Ducklings generally chip the shell from twelve to thirty-six hours before making their exit, during which time they are absorbing the remaining yolk for their support imme-

diately after hatching. When necessary to open the incubator drawer morning and evening, the chipped part of the eggs should be turned upward. If this is done quickly, gently and without too long exposure, and if the ducklings are not hatching out easily, the fractures should be examined to see if the lining membrane of the eggs is too tough. If so, a little discreet assistance by opening the shell without causing bleeding may help matters. It is not advisable, however, for the incubator to be opened at hatching or any other time oftener than is absolutely necessary, that is to say, twice daily about twelve hours apart, for any purpose whatsoever, as far more harm than good is likely to be done. Ducklings are longer in getting clear of the shell than chicks, therefore the operator should not be unduly anxious. Keep the temperature of the machine up, as there is greater danger of chilling wet and half-dry ducklings when the drawer is frequently opened and the temperature thereby being reduced.

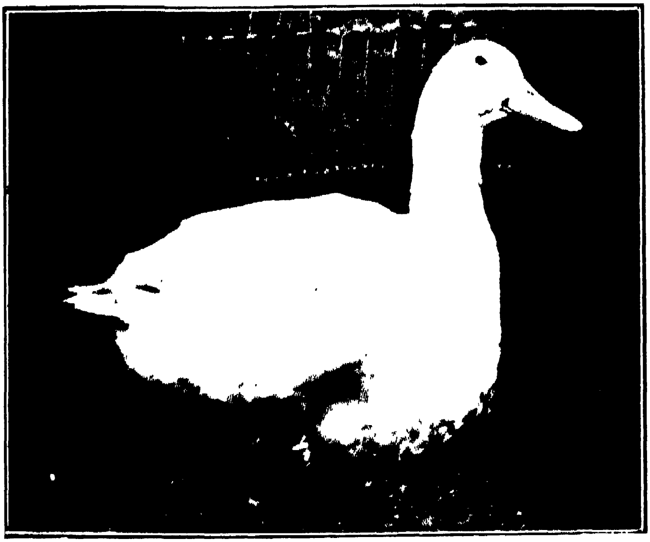
During the time of hatching there should be plenty of moisture in the egg chamber, so much that it will condense on the ventilation holes, or in some machines on the glass of the door. If the orifice made by the duckling in the shell dries, the duckling may become attached to it and be unable to work its way out. When the hatch is well advanced the ducklings should be taken from the drawer and placed in the drying box or in the nursery below the egg tray. This should be done morning and evening during the hatch, the dry ducklings only being removed to the drying box or nursery, where they should remain for twenty-four hours after the hatch is complete, when they may be removed to the brooder.

Rearing and Feeding.—The future of young ducklings depends first on the stamina and condition of the breeding stock and next on how they may be treated during the first ten days of their existence. As a general rule ducklings require less warmth than chicks, but they must be kept dry. They can be raised very satisfactorily in cold brooders similar to those used for brooding chicks. Attention should be drawn to the fact that young ducklings are very susceptible to sunstroke, and they should thus have access to plenty of shade. For young ducklings a small run covered on top to supply shade is desirable for this purpose. After a week old the

Pekin ducks. Indian Runner ducks.



Campbell duck and drake.



Aylesbury duck.

Rouen drake and duck.
(From Wright's book on poultry.)

ducklings need not be strictly confined to the hover during the night in warm weather, which will not only be a means of increasing ventilation, but during moonlight nights especially they prefer to make periodical visits to the food trough, in which dry mash should be placed. A shallow vessel containing water must also be accessible and placed a little distance away from the dry mash, when they will run to and fro and return to the hover again for warmth. This practice is a very desirable one and should be encouraged, as by this means the ducklings will make remarkably quick growth, which is essentially required for market ducks. They must have constant clean water, and they will probably insist on spilling and fouling it; this may be avoided to some extent by providing circular jam tins inverted in suitable vessels or saucers, which is the best means of supplying water. If these are placed on a board the litter is to some extent protected. The first feed should consist of fine grit, which should be given in the drying box of the machine; and when removed to the brooder a little grit may also be placed in a shallow vessel containing drinking water. When the ducklings are 24 hours old they will be ready for their first feed of mash, which may consist of—

2 parts bran;
1 part pollard;
½ part mealie meal;

moistened with skimmed milk or warm water. If skimmed milk is unobtainable, add 2½ per cent. meat meal. Alternate the above ration with boiled rice or stale bread crumbs moistened with skimmed milk or water. The food must be crumbly and damp, not sticky or too wet. Powdered charcoal may be sprinkled over the food three times a week to prevent digestive disorders and to purify the blood.

Ducklings must be fed frequently and regularly during the first few days; make sure they begin to feed, for sometimes they are slow in doing so. Do not on any account allow the food to lie about and become stale and sour, as this will prove very harmful to the ducklings. After the first ten days 5 per cent. meat meal or cooked minced meat and plenty of finely-chopped tender green food may be added to the mash with advantage. A little chick grain may be given once a day in the drinking water with the

grit when they are three weeks old. The ducklings which make good, rapid and vigorous growth and show a symmetrical development should be selected for next season's breeding, and at six weeks old they should be separated from those that are intended for the market and continue to feed as above. Place them in a large, well-shaded enclosure to develop naturally and to have plenty of exercise during the day. At eight weeks old allow them to have free range, and after the breeding season they may be turned out with the older ducks to forage about for most of their food. The ducklings that are intended for the market should not be allowed access to swimming water, and should at the age of six or seven weeks, when their frames are sufficiently grown, be confined in a small enclosure without over-crowding, and fed with the object of fattening them. Then they may be given the following mixture:—

2 parts mealie meal;
1 part bran;
1 part cut green food;
10 per cent. meat meal;

to which add a little powdered charcoal.

They must have a constant supply of drinking water and grit, and of course they must have shade. It is better to leave them a little hungry than to over-feed them. Fifteen to twenty minutes is time enough for them to eat all they should three times a day, and whatever is left should be removed. Ducklings fed in this way should weigh 5 lbs. to 6 lbs. at eight to ten weeks old.

Do not keep them longer than ten weeks old. Let this be the limit, for they then begin to grow their adult plumage and the pin feathers, which at this age start to grow, and which for the next six weeks will require a lot of nourishment for their growth, the result being that the ducklings do not put on any more weight. The food they consume would thus be wasted and add so much to their cost that instead of showing a profit they would show a loss.

An effort should be made to commence hatching as early as possible in the breeding season, and produce consecutive batches of ducklings for market throughout the season. Market birds of the same ages and as near as possible uniform in size and value at a time.

Tobacco Culture.

REPORT ON EXPERIMENTS AT THE TOBACCO EXPERIMENT STATION, SALISBURY. SEASONS 1924-25 AND 1925-26.

By A. C. Newton, B.Sc., Tobacco Adviser.

The Tobacco Experiment Station, Salisbury, has now been in existence for two seasons and is easily accessible from the town, being only four miles out on the Hatfield road.

The soil on the station is largely composed of light grey sand, typical of the majority of the poorer sand veld occurring in Southern Rhodesia. There is a certain amount of light red contact soil which produces excellent bright Virginia tobacco, and some black vlei soils which need not yet be considered in connection with tobacco growing.

As with most Rhodesian tobacco soils, the essential plant food elements are deficient, and to obtain satisfactory results artificial fertilisers must be applied. In the fertiliser tests, various strengths and constituents have been used, and the results are shown in Tables I. and II. It must be remembered that these results cannot be regarded as conclusive, since it is necessary to carry on such experimental work over a period of years in order to obtain information which may be regarded as sufficiently reliable to form the basis for definite recommendations.

TABLE I.

Commercial Fertiliser Trials.

Quarter-acre Plots. Planted 8th December, 1924, and 9th December, 1925.

Plot.	Fertiliser analysis.	Lbs. per acre.	Variety.	Yield, lbs. per acre. 1924-25.	1925-26.	Average for two seasons.	Remarks.
	N P_2O_5 K_2O						
48	7 20 10	200	Hickory Pryor	672	787	730½	1st year land.
51	6 18 8	200	do.	677	696	686½	do.
53	3 10 6	200	do.	633	721	677	do.
50	7 20 10	200	do.	631	697	664	do.
49	7 20 10	200	do.	638	613	625½	do.
52	none	...	do.	590	497	543½	Good yield, but poor quality leaf.

N = percentage of nitrogen.
P_2O_5 = percentage of phosphoric oxide.
K_2O = percentage of potash.

Duplication of the 1924-25 Plots. Planted 29th December, 1925.

Plot.	Fertiliser. N	P_2O_5	K_2O	Lbs. per acre.	Variety.	Yield, 1925-26.	Remarks.
12	7	20	10	160	Hickory Pryor	794	2nd year land.
11	7	20	10	160	do.	793	do.
16	6	18	8	160	do.	766	do.
15	6	18	8	160	do.	749	do.
10	7	20	10	160	do.	688	do.
14	3	10	6	160	do.	646	do.
13	none			160	do.	630	do.

TABLE II.

Commercial Fertiliser Trials.

Half-acre Plots. Plot 68 planted 29th November, 1925. All other plots planted 30th November, 1925.

Plot.	Fertiliser analysis.			Lbs. per acre.	Variety.	Yield, lbs. per acre.		Remarks
						1924-25.	1925-26.	
	N	P_2O_5	K_2O					
75	4	8	8	300	Hickory Pryor	...	868	200 lbs. fertiliser at planting—100 lbs. top dressed.
71	7	20	10	150	do.	...	803	..
68	6	18	8	150	do.	...	720	...
66	7	20	10	200	do.	...	711	..
67	6	18	8	200	do.	...	675	...
73	7	20	10	200	do.	...	670	...
72	No. 1 superphosphates			200	do.	652	658	A lot of leaf from this plot thrown away on account of disease.
76	4	8	8	150	do.	...	633	...
69	4	8	8	150	do.	...	630	...
70	4	8	8	200	do.	...	606	...

The results of these trials indicate that the double complete fertiliser which has the formula of 7-20-10 may be expected to give good yields, but the most consistently good returns have been obtained from the 6-18-8 formula, which contains phosphoric oxide in water-soluble form and in which the nitrogen in water-soluble and partly in organic form is present. Blood meal is the most common source of such nitrogen. The supplying of a portion of the nitrogen in organic form would be expected to give the best results, since the availability of such organic nitrogen is slower, and thus the nitrogen is gradually transformed into soluble plant food and becomes available during the later stages of growth. Inorganic nitrogen is readily soluble and is available more quickly than the organic forms, and in the event of heavy rains much of this soluble nitrogen may be leached out of

the soil. That fertiliser pays is beyond question, for not only is the weight of the crop increased, but the quality of the leaf is also greatly improved.

The most satisfactory results from single-element fertilisers were when single-strength superphosphates were applied at the rate of 200 lbs. per acre. It remains to be seen what effect this treatment may have in other seasons and in other soils.

These fertiliser trials will be continued from year to year, and after another three or four seasons it should be possible to summarise results and draw conclusions which will be of great value to the tobacco growers of this Colony.

TABLE III.

Variety Trials.

Planted 24th December, 1924, and 2nd December, 1925.

Plot.	Fertiliser.			Lbs. per acre.	Variety.	Yield, lbs. per acre.		Average.
						1924-25.	1925-26.	
	N	P_2O_5	K_2O					
35	6	18	8	160	Hickory Pryor	605	643½	624¼
37	6	18	8	160	do.	601½	629	615¼
38	6	18	8	160	do.	664	501	582½
34	6	18	8	160	do.	475½	534½	505
33	6	18	8	160	Yellow Pryor	389	505	447
36	6	18	8	160	do.	360	484½	422¼
31	6	18	8	160	White Burley	307	220	263½
32	6	18	8	160	Gold Leaf	...	243	243

TABLE IV.

Variety Trials.

Plots of the 1924-25 Season. Planted 30th January, 1926.

Plot.	Fertiliser.			Lbs. per acre.	Variety.	Yield per acre.	Remarks.
	N	P_2O_5	K_2O				
61	7	20	10	200	Hickory Pryor	759	1st year land
59	7	20	10	200	do	688	do
60	7	20	10	200	do	653	do
54	7	20	10	200	Gold Leaf	621	do
55	7	20	10	200	do	614	do
57	7	20	10	200	Yellow Pryor	485	do
56	7	20	10	200	do	454	do
63	7	20	10	200	Gold Leaf	392	do
58	7	20	10	200	Yellow Pryor	353	do

Variety Trials.—As the figures in Tables III. and IV. indicate, Hickory Pryor has been the outstanding flue-curing variety. Gold Leaf and Yellow Pryor gave very poor results and are apparently unsuited to Rhodesian conditions. White Burley gave a poor yield on light sandy soil, but this variety is capable of better results if grown on heavier land which contains a certain percentage of lime, and it is worthy of trial on such types of soil.

Several new varieties have been imported and will be tested this year. It is quite possible that some of these may prove superior to Hickory Pryor.

TABLE V.

Variety Trials. Heavy Type Tobacco.

Field No. 3. Contact Soil.

Plots 87-88, planted 30th December, 1925.
89, planted 2nd January, 1926.
83, planted 6th January, 1926.
90, planted 15th January, 1926.
93, 94, 95, planted 29th January, 1926.

Plot.	Fertiliser.			Rate per acre.	Variety.	Yield per acre.	Remarks.
	N	P_2O_5	K_2O				
88	7	20	10	200	Western	1,026	Fire cured
83	7	20	10	200	One Sucker	909	do
90	7	20	10	150	Western	753	do
89	7	20	10	150	Hickory Pryor	735	Flue-cured
87	7	20	10	150	Western	729	Fire-cured
93	7	20	10	150	Kentucky Yellow	504	do
95	7	20	10	150	One Sucker	408	do
94	7	20	10	150	Little Orinoco	296	do

The soil in Field No. 3 is a medium type of red contact sandy loam quite similar to thousands of acres in this Colony; it is stronger than the ordinary sand veld, but not nearly so strong, of course, as the representative soils of the maize belt. With the exception of Plot 89, all of Field No. 3 was planted with fire-curing types of tobacco, as enumerated in Table V. The seed of these varieties was for the most part freshly imported from America, and Western certainly proved the outstanding variety both in quality and production.

A heavy application of kraal manure would no doubt have increased these yields materially, while new land was also a factor contributing to the low yields, since old lands, when available, are always better for heavy types of leaf. Unfortunately there was that year no old land on the station, and thus maximum yields could hardly be expected. This applies only to fire-curing types of tobacco. For flue-curing types, virgin soil is always preferable.

Spacing Trials.—The results of the spacing trials are not given here because the figures might be misleading, unless the quality of leaf is also taken into consideration. For instance, the yields were slightly higher when the spacing was 2 ft. 6 in. x 3 ft. than when it was 3 ft. x 3 ft., but in every case the quality and texture of the leaf were far better from the plots spaced 3 ft. x 3 ft. From these observations the present practice of spacing, viz., 3 ft. x 3 ft., should be continued until further experimental data can be secured.

Rotation Trials.—Investigations are being made to determine suitable rotation crops to follow tobacco. Last year, amongst others, the following were planted:—Velvet beans, cow peas, Niger oil, Sudan grass, oats, rye, sunflower, kaffir corn and teff grass. Some of these crops were reaped, others ploughed under and others again partly reaped and the residues ploughed in. In each case tobacco will again be planted this season, and from the growth and quality of the leaf some information should be forthcoming which will indicate the more suitable crops to precede tobacco. Here again, however, the work is only in its infancy, and several more years must elapse before any very definite recommendations in regard to rotations can be made.

Diseases.—Black fire (*Bacterium angulatum*), commonly known as angular spot, developed to a considerable extent on the second year land which was planted in December. The new land planted in November was only slightly infected with angular spot. The 1st to 15th January plantings started growth slowly, but the final results were satisfactory and little or no spot was apparent.

Mosaic was very pronounced in the early stages of growth, but later many of the plants seemed to out-grow this disease, and injury to the leaves was hardly noticeable after curing.

White rust (*Odium tabaci*) appeared during the latter part of the season, but the spread of the disease was checked by pulling off and destroying all affected leaves.

Buildings.—During the year a standard sized barn 16 ft. x 16 ft. x 25 ft. was erected, and the Johnson patent furnace, imported from Winston-Salem, N.C., U.S.A., was

installed in this barn. The results obtained with this patent furnace have, on the whole, been satisfactory. A single curing can be done with one cord of wood, whereas two cords or more are required for the ordinary furnace. Therefore, where fuel is not plentiful, the purchase of this furnace may be advisable. Coal was tried as a fuel for curing in the patent furnace, but the temperatures fluctuated so much that the experiment was not a success. There is probably more to be learnt regarding the use of coal in these furnaces, and further trials will be carried out during the coming season.

Smithfield Prices.

Messrs. Hart, Harrison & Co., of 4 and 5 West Smithfield, London, have kindly supplied us with the following prices prevailing on 18th November:—

London Central Markets.—Beef: Fresh killed, good supplies; trade steady; prices firmer. Chilled: Plentiful supplies; trade steady. Frozen: small supplies; prices firmer. Frozen pork: Fair demand; prices firm.

English long sides, 7d. to 8¼d. per lb.
Irish long sides, 7d. to 8d. per lb.
Argentine chilled hinds, 5¼d. to 6d. per lb.
Argentine chilled fores, 3½d. to 3¾d. per lb.
Australian frozen hinds, 4½d. to 4¾d. per lb.
Australian frozen crops, 3½d. to 3¾d. per lb.
Frozen pork, 8d. to 12d. per lb.

Bee-Keeping in Rhodesia.

By T. Savory.

Though the month of January is a slack one for the apiarist, it is by no means so for the bees. The rains having set in, the veld should be full of ground flowers, which, with the farmers' crops of mealies, cotton, leguminous crops, etc., should offer quantities of pollen and nectar for drawing out and completing all frames. Continue to watch your hives, and deal with your supers, whether for extraction or for comb section honey, as you may find them being filled. Do not keep them on the hive if you find the workers are not trying to fill them, but remove them to your workshop, as if left on a quick change of temperature may tend to chill and kill off much of the brood in the brood chamber below. An unworked crate of frames also seems to discourage the inmates by too much room. When you find this the case, mark the hive out for uniting another swarm to it later on.

During January you will want to watch carefully for any evidence of the wax moth, one of the worst pests of any apiary and a great trial. The moths appear most when warm weather sets in. They will seldom be found in a strong, well-conditioned hive, whose inmates will easily repel this pest as they will all others. It is mostly to be met with in a weak or deserted hive, and can be identified by patches of particles resembling fine sawdust, which can be observed on the surface of the combs, or in various cells at the edge of the section, in which, after a short while, the larvæ can be seen eating holes in the cappings. Any frames seen attacked should at once be taken to the workshop and be placed in a tin or wooden airtight box. In this place a small saucer with an ounce or so of carbon bisulphide—a teaspoonful is enough for several frames. Then fasten the lid and leave it; all larvæ will be destroyed in the space of an hour. This liquid requires great care in handling, as it is highly

inflammable, and must not be exposed to any light and as little to open air as possible. It is a heavy gas, so should be placed on the top frame in order to permeate all of it. If the box is not airtight, make it so with paper and paste.

I notice from the October number of *Gleanings in Bee Culture* that a new chemical is being used in America for this purpose—calcium cyanide. It holds there the first place for fumigation for the control of the wax moth, destruction of wild bees in trees, etc., killing of colonies when necessary, and the control of ants in the apiary. Fumigation of combs by this means can be done by making the crate airtight and placing the dosage in the bottom. In the case of one or two crates, it can be done in the open air with safety, but of course care should be taken to keep away from all possible fumes and in all instances to handle it with great care.

In the October notes it was stated that any heavy over-crowding outside the hive body indicated a want of ventilation and called for attention at once; but this state, if noticed during December and January, will probably not require the same attention, the cause being different. The main honey flow being over, most of the bees if undisturbed remain at home, only a few going to the fields for water, pollen or propolis, so that these clusters if seen are quite normal. The large army of workers that have suddenly lacked a job must go somewhere, and if there is no room for all inside during the heat, clustering out is now the only thing for them to do, and will be until a fresh honey flow starts.

During the month of January bee-keeping can be helped forward more or less by the work of the women-folk of the farm in the laying out of the garden. It is an accepted fact that one cannot keep bees by garden work. It would take a very large garden of nectar-bearing plants to keep one hive alone going, but without doubt a selection of such can help, of which the following are only a few: Mignonette comes first by a long way, asters also are heavy in nectar, while candytuft, daisies, cosmos and stocks are considerable producers. The common fowl food, buckwheat, is one of the richest in nectar. Sweet peas and verbenas are also much favoured by bees, while snapdragons, daffodils, irises, agapanthus and most lilies attract bees, but yield mostly pollen. Sunflowers are of much value for both, and as they

can be planted from December to March, can be relied upon for a continuous yield. Melon squash, cucumber and all plants of the pumpkin family are rich in both pollen and nectar. As regards the farmers' main crops, it may be said that cotton yields quantities of nectar in America, and if it does here also, it should be a really valuable asset to any apiary. This, however, wants confirmation. Root's work on bees states re cotton: "There are many factors that influence the nectar flow and cause it to vary in different places and at different times. One of the most important factors is the soil. In Texas it rises to the rank of a great honey plant, where it yields nearly one-fifth of the entire crop of honey produced in that State." Cotton honey compares favourably with the very best grades of honey. I have watched carefully over 150 acres of cotton for the last two years, but have seldom seen bees upon it, though knowing it to be a pollen yielder. Perhaps the Department of Agriculture could give some information regarding this point. Mealie plants yield no honey, but are useful for pollen. Tobacco is reported to yield a honey of fair quality. Of the leguminous crops all such as peas, beans, etc., are valuable for honey, while in fruit trees, orange, lemon and all citrus, pawpaw and guavas are amongst the richest of the world's nectar producing plants.

Though under the heading "Choice and Position of the Apiary" this item will not be gone into until March, a few words of suggestion this month can, if acted upon, save a whole twelve months' growth of the shade so useful to any such enclosure. A space, say, 15 by 40 yards should be ample to carry up to 30 hives or even more. If a trench of that size is made 12 inches wide by 6 to 12 inches deep, and is planted this month with a good hedge, shrub or tree of a quick-growing variety, such will have all the benefit of this season's rains, and by next December should show a good growth. Here in Northern Rhodesia there is nothing to equal the Cassia Marylandica, often called in error Cassia Florida. It is of a very rapid growth, reaching in three years as much as 30 feet. It is entirely ant and drought proof, is evergreen, and will train well to any shape desired. The seed is best planted *in situ* in moist soil, and shaded with grass for the first three or four days; plant at, say, 3-inch intervals and weed out until they stand at 3 to 6 feet apart.

If unobtainable in Salisbury, the writer will have pleasure in sending the Department of Agriculture a supply of seed, strictly for this purpose. It bears a cluster of yellow flowers in the third year, and in its native habitat of Louisiana, U.S.A., yields considerable nectar.

Having tried during the last four months to pilot the beginner through some of the more necessary points in his or her work on bee-keeping, and the swarming season being due in March, I propose to reduce these monthly notes in future to a few lines, and proceed with some short articles on "Bee-Keeping as a Side Line," presuming that the owner of one or more hives of the present season has decided to proceed further and increase his holding from the experimental stage to the profitable one, commencing in the February *Journal* with (a) "The Choice and Formation of an Apiary," and (b) "The Decision and the Construction of a Standard Hive for the Same."

Back Numbers Wanted.

Mr. J. W. Shoebotham, P.O. Box 6040, Johannesburg, wishes to obtain Nos. 1, 2 and 4, Vol. XXIII. (1926) of the *Rhodesia Agricultural Journal*, and is willing to pay a reasonable price for them.

The Construction of Dipping Tanks for Cattle.

REVISED JANUARY, 1927.

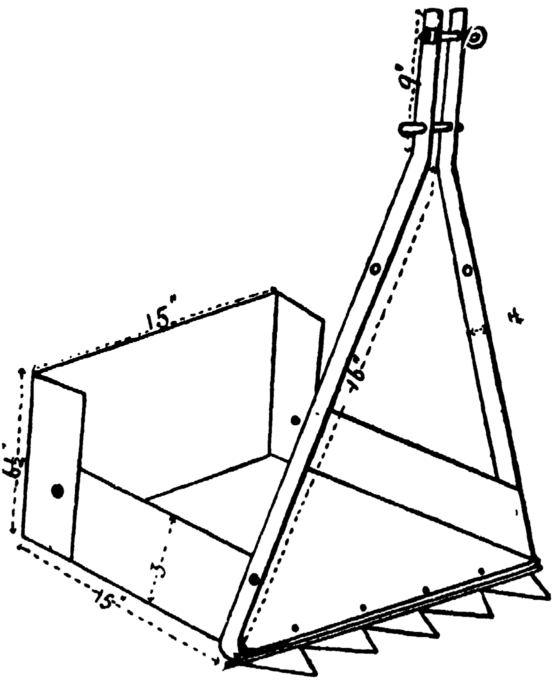
The general recognition of the great value of dipping cattle, both as a preventive of disease and for the maintenance of condition, has led to frequent demands for guidance in the erection and use of tanks. Much attention here and in other countries has been given to this subject, and plans and specifications are now approaching that uniformity which indicates practical finality, and differences of design are mainly in detail and not in principle. *Whilst the accompanying drawings may be taken, therefore, as generally applicable, they are meant to serve only as an indication of dimensions, specifications and accessory requisites of a serviceable and economical dipping tank, and are subject to modification to suit individual ideas and circumstances.* The plans are intended to serve as a model of general applicability, and are not to be slavishly followed in every instance. Throughout the specification and description, trade technicalities have as far as possible been avoided, and such simplicity aimed at that a farmer or handy man may build a tank without recourse to the services of a skilled builder or contractor.

Select a site as near as possible to permanent water, on firm and solid ground; avoid swampy ground or great difficulties may be experienced. If the site is level, fill up the space to be occupied by drip yards with excavated material until sufficient rise is obtained to secure efficient drainage.

Excavate the pit to the size and shape shown on drawings. To do this carefully mark off the centre line and other dimensions of the tank with wood or iron pegs. Cut down the sides to a straight face, and be careful not to excavate more material than is shown, otherwise it will necessitate the space excavated being filled with concrete at an additional

and unnecessary cost. Cart away or level round the site the excavated material not required for filling in. Provide a mixing board of planks or boards, bedding firmly on sand—10 ft. by 10 ft. is a convenient size—and fasten same together by driving in pegs on the outside. Cover with sand, and with a broom or shovel work the sand into all the joints until the platform becomes firm and solid.

Provide sufficient pine timber for constructing the framework, which should be carefully done. A little extra time occupied in this will be saved many times over at a later



Cattle Tank Dredger

stage, whereas a carelessly or badly constructed frame will occasion much difficulty in keeping the walls straight and true to batter, and add considerably to the cost in finishing. Pine timber 3 in. by 2 in. is suitable for struts, braces and uprights, and if placed at suitable distances the lining boards need not be more than 1½ in. thick, and of any convenient width.

The strength of concrete varies considerably, according to the quantity and the quality of the cementitious material used, also according to the nature of the aggregate employed. A coarse, clean sand and broken metal with sharp edges and irregular surfaces give a material of greater strength than that produced by fine sand and rounded water-worn pebbles, because a better surface is offered for the interlocking of the crystal formation. Stone ballast for the concrete should consist of the best clean granite or quartz, broken in angular pieces, no stone to be larger than will pass through a 1½ in. ring (any way). The stone ballast used must be thoroughly clean, or if not must be well washed before mixing. Water must be clean and free from organic impurities. From 21 to 24 gallons of water are required for every cubic yard of dry material. The sand should consist of the best clean, sharp, granite grit, free from clay, loam or vegetable matter, and if necessary, thoroughly well washed before using. The quality and proportion of the sand used are important factors in producing good work. It should not be too fine in grain, or the particles to be united together become too numerous for the quantity of cementitious material employed; it should be free from muddy or clayey particles, as these deleteriously affect the formation of crystalline silicates of lime and alumina, without which the proper setting or hardening of Portland cement cannot take place. For the best results the mortar consisting of cement and sand should be in just sufficient quantity to fill up the interstices of the stone ballast and produce a compact mass when the whole is bound together. Before commencing to lay concrete the bottom of all excavations must be damped and well rammed. Well ram all round the walls of the tank as the work proceeds. The whole of the materials should be accurately measured in boxes or empty cement casks. The concrete should be composed of six parts of broken stone, three parts of good sharp sand, and one of cement, to be turned over twice in a dry state and twice in a wet state, and when laid in place to be thoroughly well rammed. The concrete must be mixed on a wooden or iron platform, and not on the bare ground. The water must not be thrown on in buckets, but sprinkled on through a fine rose. The concrete must be laid down as soon after mixing as possible. In mixing concrete, old material must not be incorporated in the new mixing. All

concrete should be laid in boxes made with 1½ in. boards, and no layer should exceed twelve inches in height. Every old layer must be thoroughly cleaned and slightly damped before commencing to add a fresh layer. It is most important that the mixing is thorough, because it is in an imperfectly mixed concrete that cracks and flaws are liable to appear. The best way is to mix the sand and cement together thoroughly in a dry state, then place the stones on the top, mix well together dry, then add the water through the rose of a watering-can, and turn the wetted mass over at least twice before laying. Only sufficient concrete should be wetted and mixed as is immediately required. See article, "Concrete on the Farm," printed in *Rhodesia Agricultural Journal*, April, 1926.

Sometimes in the case of soils liable to much expansion and contraction, a good plan is to lay down a bed of clean, sharp sand, 6 in. or 12 in. thick, on which the concrete is subsequently placed. This better distributes the pressure, and will often prevent unequal settlement. It is also a good plan to reinforce the floor, slope and walls with steel bars, which combine with the concrete in such a way as to prevent fracture. After thoroughly consolidating the ground by ramming, lay the floor of drip yards with 4 in. of concrete as described above, packed to a regular grade and finished with the rammer. After completion, and while yet green, prepare a liquid grout of one part of cement to one of sand, run it over the same, and brush over lightly with a straw or bass broom; form the necessary channels in same for conducting the drippings to the well. All concrete must be kept well watered and covered with damp sacks or grass as the work proceeds, and all walls should be kept well wetted for a week after completion. The floors of tank, race and dripping run should be covered with wet sand for 14 days after completion. The floors of race and dripping run ought to be V jointed, diagonally from the centre to sides every 18 in., joints ¼ in. deep. All concrete must be thoroughly well rammed. The concrete must be laid as quickly as possible, and the whole of the materials must be on the ground before commencing to mix them. All concrete should be mixed under supervision, and the contractor should give due notice of his intention to lay the same before commencing work.

Before putting up the framework, lay the floor and inlet and exit slopes with concrete to the dimensions shown on the drawing, and prepare for same by carefully levelling and driving into the ground fine iron pegs or pins, which should project above the surface of the ground to the face of the concrete; put in similar pins up the slopes. In laying the concrete these will be useful for guides, and for working the straight edge from point to point.

The laying of the floor first is a most important matter, and cannot be too strongly insisted upon, as cracks which have sometimes appeared in the walls have been traced to a departure from the specification in this particular. By laying the floor first, and taking special care at the junction of the slope, a wide slab of concrete is constructed on which the walls are subsequently built, and if the work is well done, any tendency of the superincumbent walls settling will be rendered fairly uniform, and the dangers of irregular settlement considerably minimised. Build in four rows of barbed wire all round the walls—four wires in each row. The first should be placed 12 in. from the floor, then at intervals of 1 ft. 10 in. apart, well tied to iron uprights at the angles. This will further help to prevent irregular settlement taking place. Lay the wires in the position shown on section, to run right round the tank, and all to unite; top, bottom and side wires. Wire to be four-barb, two-ply, with barbs 6 in. apart. All wiring must be drawn taut.

The surface of floor in race and dripping run must be floated up with one of cement to three of sharp sand, to be well trowelled and brought to a smooth, fine face. The edge of floor of race, at entrance of tank, must be rounded. The surface of slope leading out of tank is to be finished rough, for foothold of cattle, by racking up the surface after ramming or by introducing rails. The floor of dripping run must be 4 in. thick at the sides, and slope ½ in. towards the centre. Near the exit of tank leave a hole in the floor of dripping run, to be 3 in. in diameter, fitted with a 3 in. outlet pipe. Fit a wooden plug with an iron top and ring. The plug must be left in place when dipping, and should be removed during rains to prevent rain water running into the tank. On each side of the dripping run lay a dwarf wall of concrete, to be 6 in. wide, to prevent dip washing over the floor of race when cattle enter the tank. The wall will start

from ground level, and will be 12 in. or more at the end near tank. After completion plaster the walls and floors of tank with one of cement and three of sharp sand, steel trowelled, to be not less than ½ in. thick; walls well roughened and wetted before applying the plaster. Plastering should not be attempted in the heat of the day, nor during a frosty morning or evening. The plastering should if possible be completed in one day, and should be applied while the concrete is still "green."

The same remarks regarding the quality of the sand used for the concrete apply with equal importance to that used for plastering, particular care being taken that it is not too fine.

The entrance to the tank has been designed so as to prevent cattle trying to jump out sideways, instead of plunging into the dip. Some tanks are built narrow at the entrance for this purpose and to economise concrete, but this entails additional difficulty and labour in construction, involving more expense. The ledge, which allows of handling stock in difficulties, does not extend the whole length of the tank, but terminates within 9 feet of the entrance, so as to prevent stock from using it to try to avoid the plunge. Beyond this ledge is the splash wall, which may be built of brick, faced or pointed in cement. All important dimensions are indicated on the drawings, and these should be strictly adhered to, unless it has been decided beforehand to construct the tank to other dimensions. The length of the tank may with advantage be increased by 4, 6 or even 8 ft., ensuring a more thorough soaking of all cattle passing through, and the length shown in the drawing should be regarded as a minimum. The slope down to the tank is often made much steeper than shown for the last 2 ft., and given slight steps, which prevent wily and experienced cattle from sliding in gently and launching themselves into the swim without that immersion of the head which is so essential for tick destruction. In several tanks the width at the bottom has been reduced from 2 ft. 3 in., as shown, to about 1 ft. 9 in., with a view to lessening the quantity of dip in the tank at any one time. This saving is more apparent than real, for the loss of the dip is mainly that removed by each animal, and the main saving is derived from the prevention of splash and of loss in the dripping run and drying pen. The exit should be

provided with ridges to give a grip to the feet, for which cement or short lengths of rail, pipes, or 16 lb. fence posts are admirably adapted. The whole of the posts may be of mopani or mohobohobo, or some similarly suitable native timber, which should not be less than 5 in. diameter at the small end, stripped of bark and well carbolineumed before erecting. The race will be formed of poles or rails, as shown on plan. Posts for yards should be not more than 10 ft. from centre to centre, let into ground 18 in., and well rammed. All posts must be 6 ft. above the ground, and free from knobs or projections. Well spike to posts round the whole of the yards and enclosures three or more $4\frac{1}{2}$ in. by $1\frac{1}{2}$ in. rails, all well carbolineumed before fixing. The posts must be dressed quite clean to prevent injury to cattle. Rails may be deal, clean and free from knobs and splints. Native timber may be used for rails if procurable, but it must be straight and quite free from knobs or projections that might cause injury to animals. A few slip rails should be available in order to prevent cattle from backing out of the entrance race. Such rails might be of smoothed native timber about 4 in. diameter.

Both the entrance race and exit run may be built either straight or curved, as may be found best suited to the site selected and for the arrangement of the kraals. On the accompanying drawing these are for convenience shown straight.

The dripping run need not necessarily be built as a narrow run all the way as shown, but may very usefully be widened into a concrete or slab-paved pen or kraal, where a larger number of cattle may be kept and allowed to drip more thoroughly. The arrangement of the kraals is also a matter in which a wide discretion with common sense is permissible, depending on the configuration of the site.

A considerable saving in dip may be effected by extending the dripping pen to 60 or 70 ft. and erecting brick or stone sides, or, where wire is used, by extending the concrete floor about 6 in. outside the line of posts and wire. Recent observations have shown that the most economical draining arrangement is a large pen with stone or brick walls; this is divided into equal portions by a wall ending about 4 ft. from exit from tank at ground level; at the end of this wall

a gate or door is swung to close on either side of the walls or fencing at end of tank; this enables the pens to be filled and evacuated alternately without any loss of time. Each pen should be large enough to accommodate about 30 head.

The size of the collecting kraal will depend upon the numbers to be handled at one time, and as a guide, 18 square feet per beast may be regarded as a convenient allowance, though a kraal 60 ft. by 30 ft. would accommodate about 100 head comfortably. Drinking water should be provided in troughs in this yard, or somewhere convenient for the stock before entering it, as animals entering a dipping tank suffering from thirst are very liable to drink from the dip as they pass through. On leaving the dripping run it is well to keep the herd in a resting kraal till dry to prevent poison being distributed on the surrounding veld. The tank itself should for similar reasons be fenced off from adjacent ground for a distance of about five yards all round. Within this space drums of dip and any appliances used in dipping may be kept. The tank or sump for the reception of the old dipping fluid when the dipping tank is being cleaned out should be similarly protected. When the walls and floors have become dry, select a warm day with good sunshine, and coat the whole of the floor, exit and inlet slope and walls up to the water line with hot coal-tar, well boiled, with 1 lb. of pitch added to each gallon of tar. When the same has become dry it should receive a second coat of the same material, which should be well worked into all corners and angles. This will tend to close the pores and prevent undue absorption. One gallon of tar and 1 lb. of pitch will cover 11 square yards the first coat, and a larger area the second coat. In filling the tank for the first time a certain quantity of fluid will be absorbed and lost through leakage and absorption. These losses, however, may be expected to become reduced as the tank is refilled and the minute particles in the water or dip fill the coarser interstices of the concrete.

The quantities of material required are as follows:—

Pipes—

10 pieces 1½ in. diameter pipe, 6 ft. long, across exit.
1 piece 3 in. diameter pipe, 4 ft. 6 in. long.
1 piece 3 in. diameter pipe, 1 ft. 9 in. long.

Timber—

Rails, 6 pieces 12 ft., 4½ in. x 1½ in.
Rails, 12 pieces 14 ft., 4½ in. x 1½ in.
Rails, 48 pieces 20 ft., 4½ in. x 1½ in.
Slip rails, 6 pieces 10 ft., 3 in. x 3 in.
Slip rails, 3 pieces 15 ft., 3 in. x 3 in.
80 posts, 5 in. diameter, 7 ft. 6 in. long.
30 posts, 5 in. diameter, 8 ft. long.
9 pieces, 15 ft. long, 9 in. x 1½ in., deal.
3 pieces, 17 ft. 6 in. long, 9 in. x 1½ in., deal.
4 pieces, 11 ft. long, 9 in. x 1½ in., deal.
2 pieces, 7 ft. long, 9 in. x 1½ in., deal.

(Native wood may be used in the place of imported timber.)

1½ coils barbed wire.
15 gallons carbolineum.
50 lbs. 5 in. spikes.
44 casks (88 bags) cement.
40 cubic yards broken stone.
20 cubic yards sand.
1,600 bricks.

This specification is regarded as the minimum as regards size and capacity for the dipping of cattle, but it will be found much more satisfactory, especially where large numbers of cattle are being dipped, to increase the size of the tank and build the kraals as described hereunder:—

1. The jump-off to be 7 ft. instead of 6 ft.

2. Length 38 ft., instead of 34 ft. 6 in.—that is, the swim is 19 ft. and the slope to exit is also 19 ft., making it 38 ft. in all.

3. The inlet race, instead of being boarded, to be a brick wall 12 ft. long by 4 ft. 6 in. high, with jump-off ridge 1 ft. from the lip of the tank.

4. Draining kraal to be triangular in shape, 50 ft. at its base and 40 ft. on two sides, with a divisional fence with a swing gate at the exit of the tank to enable the cattle to be more thoroughly drained.

The entrance race should, where possible, incline slightly upwards to within a short distance of the tank so as to keep back dirt, dung and liquid from polluting the

tank, and the last few feet only incline towards the tank. This is shown on the drawings, but may not always be practicable. The slight bar shown at the very commencement of the concrete race is often overlooked. This is very essential to prevent flood water coming into the tank from the direction of the collecting kraal. In a very complete tank lately built, the cattle in passing along the race from the collecting kraal to the tank are made to walk through a concrete foot-bath or trough a few inches deep filled with water so as to clean their feet and prevent the mud sticking to them from entering the tank and polluting the dip. The entrance race must be strongly built to withstand the pressure of the cattle, and may either consist of rails of native wood, not more than one foot apart, or of 1½ in. boards. The wings extending from this fence over the tank should be made of planks to prevent animals seeing out over the side, and so being tempted to get out that way. The posts must be securely fixed and supported with strong stays. Old rails are often used for this purpose. The dripping run should not be less than fifteen yards long, and additional length implies further saving in the dip draining off, especially where large numbers are to be handled and the animals are not allowed to stand in this run. The return of dip from the dripping run into the tank and the diversion of rain water falling on the race are provided for by pipes through the kerb edge, one leading outwards, the other passing back into the tank as shown on the drawings. Another method is to carry a pipe through the kerb into a small settling cistern (say, 12 in. x 18 in. x 24 in. deep) constructed alongside the dripping run, and out of which a second pipe leads back into the tank at a lower level after sediment has been deposited. By means of wooden plugs, the dip or rain water from the dripping run may be carried into the tank or drained away. At the exit the barrier between the dripping run and the tank is usually made too small to divert rain water from entering the tank on that side, an accident likely to occur, as the drying kraal is generally placed on a slope above the tank. This inflow of storm water must be guarded against, as it fills the tank with dirty water and leads to complete confusion as to the strength of the solution in use. Care at the outset on these details saves much subsequent trouble.

A pulley tackle is a great convenience for dealing with obstreperous beasts. The rope may either be adjusted round the horns, or a large loop carried right over the back, under the tail, and along the flanks, a method which renders resistance of little avail.

The following schedule gives the approximate capacities of a tank built strictly to the dimensions shown on the drawing, but as it is only in very rare instances that tanks are built exactly to these dimensions, it should serve as a guide only, and is not to be relied upon when mixing the dip. The only accurate method of ascertaining the capacity of any dipping tank is by means of introducing the dip (or water) from a smaller tank (or buckets) of known dimensions. A tank of, say, 100 gallons capacity could be erected in such a position that its contents can be emptied into the dipping tank. The level attained by each emptying, which in this case is equivalent to 100 gallons, can then be indelibly marked on the side of the tank or on a gauge post placed in the tank.

Depth. Feet.	Depth. Inches.	Gallons.	Depth. Feet.	Depth. Inches.	Gallons.
0	0	0	4	0¾	1,600
0	4¾	100	4	2¾	1,700
0	9	200	4	4¾	1,800
1	0¾	300	4	6½	1,900
1	4½	400	4	8¼	2,000
1	8	500	4	10	2,100
1	11½	600	4	11½	2,200
2	2½	700	5	1	2,300
2	5½	800	5	2½	2,400
2	8½	900	5	4	2,500
2	11¼	1,000	5	5½	2,600
3	1¾	1,100	5	7	2,700
3	4	1,200	5	8½	2,800
3	6¼	1,300	5	10	2,900
3	8½	1,400	5	11½	3,000
3	10¾	1,500	6	0	3,060

Hints on Dipping.—As proprietary dips are now generally used instead of the arsenite of soda or Natal Laboratory dip, it is only necessary to state that full instructions are supplied with each tin, and these should be rigorously adhered to.

In order successfully to accomplish the object for which the process is practised, viz., the destruction of ticks, it is essential that the fluid be maintained at the proper strength. If it falls below this, ticks are not destroyed, and so much time and money are wasted; if it becomes too strong, much injury may be caused to the animals dipped, and in some cases serious mortality may ensue.

The strength of the fluid is altered by evaporation or by addition of water. It is pure water only which evaporates, and evaporation, therefore, results in an increase of the strength of the remaining fluid. The addition of rain and flood water naturally causes a diminution in the strength of the fluid. A thatched roof is usual over the tank to prevent excessive alteration in the strength of the dip owing to evaporation or addition of rain water. If the following procedure is faithfully adhered to, the strength of the fluid will be maintained at, or sufficiently near for practical purposes, the proper strength. After each dipping the depth of the fluid in the tank should be accurately measured, and the result recorded in a book specially kept for the purpose; it is fatal to trust to memory in a matter of this sort, where the result may be so serious. Immediately before the next dipping the depth should again be measured, and any difference in the quantity of the fluid accurately calculated. If there has been a decrease, water alone to the extent of same should be added. If there has been an increase, dip should be added in proper quantity to make such increase equal in strength to that which is being used in the tank. On no account should this procedure be omitted, even where the increase or decrease is small, because the repetition of such must result either in the fluid becoming so weak as to be useless, or so strong as to be injurious and even fatal.

Each animal that passes through the tank takes with it a quantity of the fluid, estimated at between half and one gallon; the level of the fluid in the tank is thus gradually lowered. To make up this deficiency, water with dip in the proper proportion must be added.

The chief reason for dipping is the destruction of ticks, which are transmitters of various diseases, amongst which in cattle may be mentioned African Coast Fever, Gall-sickness and Redwater. It is, however, against the spread

of Coast Fever infection by this agency that dipping is now so largely practised. But it has been found that the dipping of cattle has many other advantages. Apart from the disease-bearing capacities of ticks, it is evident that their presence on animals is a serious drawback, chiefly because of the large quantities of blood extracted, which should go to growth, or to improvement in condition, or to the increase of the milk supply. Not the least of the benefits of dipping is the reduction of the mortality amongst calves from white scour, liver disease, etc. Instances can be given where such mortality has been reduced from 60, 70 or even 80 per cent. to nil.

Apart from Coast Fever areas, where short intervals are necessary, dipping as a general measure should be practised every seven days. Fortnightly dipping, or dipping only when ticks are seen on the animals, is of very little value. This is evident when it is considered that our most dangerous ticks, i.e., those which transmit Coast Fever, only remain on an average four days on the bovine host. In many cases animals which to the eye are apparently free from ticks will on close examination be found to harbour large numbers of the larvæ and nymphal forms, especially in the ears, where some of the Coast Fever-bearing ticks are most commonly found. It should be remembered that the ticks most commonly seen are the engorging females, that the males are small, and on a beast with an average coat, not easily seen.

It is advisable to give working cattle a day's rest after immersion in the tank, but some farmers inspan them as soon as the skin is thoroughly dry. Where seven-day dipping is practised, the dipping can be carried out on the Saturday afternoon, thus giving the animal at least 1½ days to recover.

Opinions vary as to the effect of dipping on milch cows. Some assert that the quantity of milk is decreased to a large extent for 24 hours, and even longer, after dipping; others say that the effect in this respect is not appreciable. Assuming, however, that there is a slight immediate loss, it should be remembered that there is a general increase because of the better condition of the animals as the result of regular dipping.

MANAGEMENT OF DIPPING TANKS.

By J. M. Sinclair, Chief Veterinary Surgeon.

In a paper entitled "Notes relating to Arsenical Dipping Fluids," by Mr. A. G. Holborow, F.I.C., Assistant Agricultural Chemist, which appeared in the *Rhodesia Agricultural Journal* of December, 1915, it is stated that "it should be an easy matter, knowing the volume of liquid in the tank and the exact strength of it, to rectify any deviation by adding water only, or dip, as the case may be, and bring the dipping fluid to any desired strength." The writer agrees entirely with this view, but his experience shows that many owners and managers of tanks find a considerable difficulty in doing so. In some cases the reason is that the capacity of the tank inch by inch is not known, or, if known, is not made use of in calculating the quantity of water or dip required to bring the liquid in the tank to the proper strength. In other cases, the quantities are calculated in a haphazard or crude manner, with the result that the strength may be so increased as to cause damage to the cattle, or so diminished as to be ineffective. The tendency in the majority of cases is in the latter direction, probably because the persons concerned, not being quite sure of their quantities, prefer to err on the side of safety.

The following notes on the management of the dipping solution and dipping tanks generally will, it is hoped, be of some assistance to stock owners.

1. At the first filling the water should be measured into the tank by a 200 gallon or other convenient measure.

2. From the 3 feet 6 inches level the volume, inch by inch, should be carefully recorded and marked on the wall of the tank, or preferably on a measuring rod, which can be obtained at a small cost.

3. The level should be recorded after each dipping and again before the following one.

4. Any decrease due to evaporation should be replaced by water only.

5. Any increase due to rain or flood water should be made up to standard strength by the addition of the corresponding quantity of dip.

6. When a sample is taken for analysis the quantity of solution in the tank at the time should be accurately estimated, otherwise it is impossible to rectify any excess or diminution of strength shown by such analysis.

7. The following example is given of correcting the strength of the solution in the tank on receipt of the result of the analysis:—

(a) capacity of tank at proper dipping level—3,000 gals.;

(b) prescribed strength of dip used—say, 1 to 150 gals. of water;

(c) quantity of solution in tank at date sample was taken—say, 2,400 gals.;

(d) assume analysis shows strength—1 in 200;

(e) then the 2,400 gallons in tank contain 12 gallons of dip only, instead of 16 gallons; therefore, 4 gallons of dip must be added to bring the solution up to proper strength;

(f) there remain the 600 gallons of water required to bring the volume in tank up to the proper dipping level; this requires another 4 gallons of dip;

(g) the total quantity of dip, therefore, which is required to rectify the diminished strength of the solution in the tank, and provide for the 600 gallons of additional water added to the tank, is 8 gallons.

8. Where necessary, the tank should be protected by drains, to prevent the dip being flooded out on to the surrounding veld.

9. When not in use, the entrance and exit of kraals and draining pens should be properly secured.

10. The draining pens should be so constructed that dip cannot collect in them.

11. The drums, whether closed or not, containing the concentrated dip should be kept under lock and key.

12. When emptied, the drums should be immediately and thoroughly washed, and the washings placed in the tank or buried.

13. Where kraals are used in addition to draining pens, in order to allow cattle to drip and dry completely, cattle should not be allowed into them until any water which may have collected in pools has been dispersed.

14. Tanks should be so protected by fencing that animals cannot have access to any ground contaminated with arsenic from splashings during dipping and leaking draining pens.

CATTLE CLEANSING ORDINANCE, 1918.

By J. M. SINCLAIR, Chief Veterinary Surgeon.

The attention of stock owners in areas in which the above Ordinance is now in force is directed to sections 5 and 6 thereof, which provide that cattle shall be cleansed by dipping at regular intervals of seven days in an "effective tick-destroying agent." An effective tick-destroying agent is defined as "an aqueous solution containing the equivalent of .16 per centum of arsenious oxide, or such other percentage of arsenious oxide or such other ingredients in such proportion as the Administrator may from time to time prescribe by notice in the *Gazette*." It is not intended to vary the percentage of arsenious oxide defined above, and to conform to this standard the following dilutions of the dips now commonly used are required:—

(1) Arsenite of Soda.
8 lbs. of arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

(2) Cooper's Improved Cattle Dip.
1 gallon of dip to every 156 gallons of water.

(3) Arsenoda Cattle Dip.
1 gallon of dip to every 350 gallons of water.

(4) St. O'Gorman Cattle Dip.
1 gallon of dip to every 200 gallons of water.

(5) Cooper's Tixol.
1 gallon of dip to every 400 gallons of water.

(6) Capex.
1 gallon of dip to every 400 gallons of water.

(7) Champion Improved.
1 gallon of dip to every 300 gallons of water.

(8) Conquest.
1 gallon of dip to every 400 gallons of water.

(9) Arsenicola.
1 gallon of dip to every 400 gallons of water.

(10) Champion Improved Star.
1 gallon of dip to every 400 gallons of water.

(11) Champion Improved Special.
1 gallon of dip to every 200 gallons of water.

(12) Champion Arsenical Cattle Dip.
1 gallon of dip to every 300 gallons of water.

All Government Notices relating to the strength of cattle dips have been cancelled, and all departmental notices relating to the same are hereby cancelled.

ARSENITE CATTLE DIP.

How to Mix.

First dissolve the arsenite in a sufficient quantity of hot water to dissolve the crystals completely. Then add water to make up to 400 gallons, stirring vigorously the while.

Although it will probably be found most convenient to dissolve the arsenite in a few gallons of hot water, this may be carried out in a short time with cold water in the following manner:—

Place two or three pounds of arsenite in a bucketful of water and stir vigorously for five or ten minutes. Allow any undissolved particles to settle, and pour off the liquid into a tank. Then add more arsenite to that remaining in the bucket and fill up with water again, repeating this till all the arsenite is dissolved.

Have proper weights and scales, and be accurate in measuring the arsenite. Always keep arsenite under lock and key as a dangerous poison. All arsenite must be completely dissolved before being added to the dipping tank.

Solutions prepared as above can be added to tanks now containing arsenical proprietary dips.

For three-day dipping—

4 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

For seven-day dipping—

8 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

WASTAGE OF DIP IN DIPPING OPERATIONS.

By J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

Owing to the high cost of cattle dip, the conservation of fluid by the use of adequate draining pens is a matter of pounds, shillings and pence, and, as it will probably be a long time before prices come down to pre-war rates, tank owners would be well advised to consider the draining arrangements at their tanks with a view to reducing wastage to a minimum.

The following observations made by the Department show that proper draining accommodation means a saving of many pounds per annum—

Tank.	Drainage.	No. of cattle.	Wastage in gallons.
1	Large single pen	1,250	480
2	Double pen	680	200
3	Race 34 feet	603	300
4	Race 30 feet	1,004	720
5	Race 60 feet	1,200	400
6	Race 60 feet	1,643	385
7	Race 72 feet	1,650	290
8	Race 72 feet	1,635	300

In considering these quantities, the size of the cattle must be taken into consideration. At tanks Nos. 1, 3 and 4, which are on or adjoining Salisbury commonage, dairy cattle predominate, and the number of small animals, i.e., calves, yearlings and two-year-olds, will therefore be greater than in the average herd of farm cattle. The cattle at No. 2

tank are highly graded throughout, and the average size is considerably larger than in the average herd of farm cattle. At tanks Nos. 5 to 8 inclusive the animals are of the small Mashona type. The double draining pen and the long draining races are very economical; in the latter the wastage is governed largely by the speed at which the cattle are driven through. The single draining pen can be made as economical as any other plan, but only by a considerable wastage of time.

DIRECTIONS FOR TAKING SAMPLES OF DIP.

The taking of a sample of dip requires care, and should never be left to a native. Thoroughly cleanse a bottle of the "whisky" size. When the contents of the tank have been thoroughly stirred, preferably by the actual dipping of cattle, rinse out the bottle with solution from the tank. Then fill the bottle completely with solution, cork securely, and stick on the bottle a label stating sender's name, farm, postal address, kind of dip used, and the date on which the sample was taken.

It is not necessary to send a covering letter, except when special information in addition to the analysis is required.

When it is expected that the sample will take a week or more to reach the laboratory, it is wise to add about 10 spots of sulphuric acid (free from arsenic) to prevent oxidation en route.

A farmer should not expect the Chemist's analysis to save him the trouble of keeping account of the amount of water and dip added to or lost from his tank.

A DIP-TANK DREDGER.

Dipping tanks in use always tend to accumulate a quantity of sediment at the bottom. Though this cannot be avoided, the deposit should be cleaned out as often as possible, because not only is it objectionable to use a filthy dipping fluid, but if the slime or mud is left undisturbed week after week, it soon increases sufficiently to reduce

appreciably the capacity of the tank. The result is that measurements of the quantity of solution present, based on fixed marks on the tank wall, cease to be accurate, and any estimate of the amount of chemical dip, or water, to be added will be unreliable, so that it becomes impossible to keep the solution at the right strength. The danger of this state of affairs is obvious, and the only remedy is to clean out the tank regularly.

In order that this may be done without emptying the receptacle, several devices have been tried with varying success. One of the best, which is in use in the Salisbury district, is shown in the diagram on page 64, which gives the approximate dimensions. Little further description is necessary beyond stating that the material of the scoop is thin sheet iron riveted as shown, the front edge is armed with part of an old mower blade riveted in place, the two bent stays are made of flat iron, and the two bolts shown near the top are for holding in position a vertical pole about 10 feet long. On the oblique part of the stays will be seen two small holes drilled in the flat iron. These are for the reception of two lengths of strong wire.

The method of use is as follows:—The scoop is dropped to the bottom near the middle of the tank, being kept in place by the upright pole held by a man standing on the top of the wall. At the plunge end, two persons hold the ends of the long wires ready to pull. As soon as a strain is put on the wire, the pole-holder may, if necessary, give the scoop a slight forward tilt to cause the mower teeth to enter the mud. When the scoop is full, it is lifted out at the plunge end by means of the two wires and the pole, the latter being now slightly tilted backwards. The process is repeated as often as possible, working always towards the plunge end of the tank, where the greatest mass of deposit will be found. It would be an advantage if the tank were dredged after every dipping day, especially where large numbers of cattle are put through, but this is not absolutely necessary, and in practice it is only used occasionally as the sediment collects.

The Kalahari Reconnaissance.

By N. P. SELLICK, M.C., B.Sc., B.Sc. (Eng.),
Assistant Hydrographic Engineer.

Historical.—The Kalahari Desert was visited by a number of travellers in the middle of last century. Of these, Livingstone and Chapman are perhaps the best known. The former, in describing the country, put forward the theory that the Zambesi River, owing to an upheaval of the earth, had drained a large lake previously existing in the Kalahari, and this was more or less responsible for the dry state of that area to-day.

Little is known of the past history of the Kalahari. Careful perusal of the writings of the early explorers is confusing, the general opinion, however, being that the Kalahari was drying up. Various estimates of the size of Lake Ngami are available from 1849 onwards, and these are in good agreement with its present extent.

A Recent Proposal.—In recent times a scheme has been put forward by an eminent geologist. He postulates that South Africa is drying up, and maintains that this is due to diminishing rainfall caused by the progressive drying up of the lakes in the Kalahari. He therefore recommends that dams should be built to divert the flow of certain rivers—the Kunene and Linyanti in particular—into the existing basins in the Kalahari, where a proportion of the water would be evaporated to increase the rainfall of South Africa, and the remainder could be used for irrigation.

The Desiccation of South Africa.—This scheme has met with little or no support from scientific circles. With regard to the postulates, there is some evidence that South Africa is drying up, but the evidence that this is due to decreasing rainfall is inconclusive, and the suggestion that the presence or absence of lakes in the Kalahari would affect the general

climate of South Africa in any marked degree is very much open to doubt.

The question of the drying up of South Africa has been brought to the fore on many occasions. There are three possible causes:—

(1) A decrease in the average rainfall over the country.

(2) A change in the rate of precipitation from frequent showers to infrequent showers of great intensity.

(3) Clearing of veld and soil erosion.

With regard to (1) the period during which accurate rainfall statistics are available is very short, but there are no grounds for the conclusion that the average annual rainfall over the country is decreasing.

(2) The lack of statistics makes a decision on this point still more difficult, but in certain cases which have been examined there appears to be a tendency towards the shortening of rain periods and an increase in intensity.

(3) Veld erosion is due to the clearing or tramping down of vegetation, and is the natural result of the thoughtless and undirected activities of the white settler. Its first effect is to increase the storm run-off from the veld, creating dongas and decreasing the winter flow of the rivers. The evil effects are progressive, owing to the diminished covering of vegetation; the soil is dried out more rapidly, and becomes baked and hard and less able to absorb the rain; the water table is also lowered and springs and wells gradually dry up.

The Expedition.—In 1924 an anonymous donor presented the Union Government with £1,000 for the purpose of having investigations made on the Zambesi as to its possibilities in respect to water power, irrigation, etc. An expedition was fitted out in 1925, and made an extensive survey of portion of the Zambesi River, the Linyanti River, the Mababe depression, and reached as far as the borders of Lake Ngami. The survey consisted of spirit levelling and astronomical determinations of position, and a high degree of accuracy was maintained. A considerable area was also surveyed by aeroplane photography. A report of 69 pages, accompanied by numerous photographs and maps, was issued in 1926. The work of the expedition was limited to the Zambesi

section, and the possibilities of the Kunene River and the Etosha Pan were of necessity ignored. It is the purpose of this article to give a short summary of the conclusions arrived at by the expedition and the reasons therefor.

The Okavango River.—There are three large rivers flowing eastwards in the area surveyed; by far the largest of these is the Zambesi. The Okavango forms a large delta to the north of Lake Ngami, and in normal years the evidence is conclusive that the whole flow of the river is evaporated in this area. In high floods a portion of the water flows into the Linyanti by way of the Makwegana spillway, and so into the Zambesi. Thus, so far as the Okavango is concerned, the greater part of its flow is already evaporated in the Kalahari. It would be possible, at great expense, to canalise the river through the delta, and so lead it *via* the Botletle River to the Makarikari Pan, where its evaporation near the Rhodesian border might have some effect on the climate. It must be noted, however, that the prevailing winds at Bulawayo are south-easterly, and unless the winds in the upper air are westerly no noticeable effect can be expected.

The Linyanti River.—It has been suggested that a simple earth bank across the Linyanti near Ngoma would turn this river back from the Zambesi. Survey of the proposed site, however, has proved that this is impracticable, as it involves the construction with most unsuitable material of an earth bank 50 feet high in the river, diminishing to 30 feet high five miles from the river, and continuing for an unknown distance further.

Zambesi Diversion Scheme.—From gaugings of the Linyanti River and from other considerations, it appears doubtful whether the flow of the river would be sufficient to keep the Mababe depression full of water, and the expedition was forced to the conclusion that any scheme for the diversion of a large volume of water south-westwards into the Kalahari would involve storage and diversion of the Zambesi itself. Two possible sites for diversion works on the Zambesi were surveyed, and the site at Katombora, about 30 miles above the Falls. Designs and rough estimates were taken out for a weir across the river at this point, making due allowance

for the rights of the Victoria Falls Power Company and for a minimum flow over the Falls; allowance was also made in the estimates for the removal of natives from the flooded area.

To make an irrigation scheme practicable in the Kalahari it will be necessary to make the Katombora Weir 60 feet high; the length of the weir would be 9,600 feet, and it would contain 600,000 cubic yards of concrete. The storage basin was not surveyed in detail, but it is estimated from the figures available that the basin would hold 80 million acre-feet (one acre-foot is equal to more than a quarter-million gallons) of water, and that, allowing for compensation water, absorption and evaporation, the reservoir would take 10 years to fill. The water surface of the reservoir would have an area of roughly 4,600 square miles, a little more than one-third of the size of Lake Tanganyika.

With proper regulation this scheme would supply sufficient water for the irrigation of 500,000 acres; the compensation water, in addition to supplying 250,000 h.p. at the Falls and 10,000 cusecs for the maintenance of the Falls, would be capable of developing up to 120,000 h.p. at the weir.

The cost of the storage scheme, without making any allowance for distribution works, would be in the neighbourhood of £4,000,000 by the time the water was available for irrigation purposes.

Several smaller irrigation schemes are examined in the report.

Final Conclusions.—The final conclusions of the expedition are:—

That there is no evidence of a diminution of rainfall in the Kalahari during the historic period, or of the existence in the past of extensive lakes in that area.

That, owing to the enormous evaporation and absorption losses, no scheme of flooding extensive areas in the Kalahari is possible without including the bulk of the Zambesi flow.

That the scheme for damming the Zambesi at Katombora is practicable from the engineering point of view; no information, however, is available as to the existence of a sufficient area of suitable soil for irrigation.

That the creation of this vast area of water in the Kalahari is unlikely to have any appreciable effect on the climate of South Africa.

That none of the projects discussed in the report is likely to be of any direct benefit to the Union.

It is interesting to note that the report puts forward an alternative theory to explain the peculiar river systems of the Kalahari. The position of Lake Ngami, the Okavango delta and the Mababe depression and smaller details throughout the area suggest that this great hollow may be an outlying portion of the Great Rift Valley, which forms so conspicuous a feature of African geology and includes the lakes of Tanganyika and Nyasa in its course.

Should this be the case, we may take it that these rivers originally flowed across the Kalahari, the Okavango by way of the Makarikari, and the Macloutsie River to the Limpopo, the Zambesi straight across to Mambova, and the Linyanti probably followed its present course. With the sinking of this tract of land across the courses of these rivers they would begin to form deltas, and the country beyond—the Makarikari in particular—would be deprived of its water supply. Should this explanation be the true one, the cutting off of these rivers must have occurred at a remote period, and could have little or no influence on changes of climate occurring to-day.

Movements of New Settlers.

New Arrivals.—The following new settlers have arrived in the Colony during the month of November, 1926:—

N. C. Crowe.—Arrived from Natal on 1st November, 1926, and joined Mr. O. C. Rawson on Darwendale.

W. J. Hartnoll.—Arrived from Burma on 2nd November, 1926, and is now with Mr. W. H. Swain on Lancaster, Lydiate.

Capt. C. L. R. English.—Arrived from England on 2nd November, 1926, and proceeded to Major Foran's farm, Fault, Macheke, for a period of training.

J. G. Gaveshon.—Arrived from the Union on 3rd November, 1926, and joined Mr. J. R. V. Brown on Huish, Marandellas.

H. H. B. Day.—Arrived from England on 5th November, 1926, and is now undergoing training with Mr. H. L. Jenkins on Gungwe Farm, Chatsworth.

E. O. Martyn.—Arrived from England on 5th November, 1926, and joined Mr. J. Beckingham on Datata, Bromley.

H. T. Ley.—Arrived from England on 5th November, 1926, and is now with Mr. H. B. Christian, Ewanrigg, Arcturus.

Mr. and Mrs. A. G. Simpson.—Arrived from England on 5th November, 1926, and have been accommodated on Gwebi Government Farm.

J. F. Rutherford.—Arrived from England on 12th November, 1926, and proceeded for a period of training to Mr. R. J. Tarrant, Delta, Marandellas.

H. J. Aukett.—Arrived from England on 14th November, 1926, and after a short stay in Salisbury proceeded to Mr. L. L. Green's farm Acton Reynold for a period of training.

H. A. Coke-Norris.—Arrived from England on 15th November, 1926; and is now with Mr. T. H. Smetham, Penhalonga.

Commander and Mrs. M. J. Arnaud.—Arrived from England on 16th November, 1926, and are staying with friends.

H. A. Clanahan.—Arrived from England on 17th November, 1926, and joined Mr. O. C. Rawson, Darwendale.

Mr. and Mrs. A. G. Morley.—Arrived from England on 21st November, 1926, and are now residing on Nhuku Farm, Beatrice.

A. J. Winn and R. E. Jacobs.—Arrived from England on 21st November, 1926, and are undergoing training with Mr. O. C. Rawson, Darwendale.

A. H. J. Wenborn.—Arrived from England on 21st November, 1926, and has since joined Mr. C. J. Andrews on Msonneddi, Umvukwes.

R. H. Cowan.—Arrived from England on 21st November, 1926, and proceeded for training to Mr. O. C. Rawson, Darwendale.

A. Pritchard.—Arrived from the Union on 25th November, 1926, and has since joined Mr. E. D. Blackburn on Highbury, Sinoia.

Settlers who have taken up Land.—Mr. and Mrs. E. A. Loames.—Have acquired a portion of Glen Lorne Estate, near Salisbury.

Settlers who have left the Colony.—A. N. Foord.—Has left Salisbury for England, owing to the indifferent health of his father.

Southern Rhodesia Veterinary Report.

September, 1926.

AFRICAN COAST FEVER.

Umzingwane District.—Infection was discovered on plot 50 in the eastern section of the Essexvale Estate. This area was regarded with suspicion because of certain cattle moved to it from south of the Umzingwane River prior to the discovery of the original infection there, and there is now no doubt that these animals carried the disease with them. The cattle on this plot are being temperatured daily and all suspicious cases are destroyed. A dipping tank is being erected to deal with all cattle lying east of the Bush-tick tank area, which are treated as infected. In the Essexvale south section a new dipping tank was completed, and all the cattle south of the Umzingwane River are being dipped in it. This area is heavily infected, and arrangements were made to move various herds from it through temperature camps to the northern side of the Umzingwane River to supposed clean veld. The mortality during the month was 10 head at the Essexvale east section and 377 head at the Essexvale south section.

Matobo District.—No fresh outbreaks occurred. The mortality in the infected herds was 98 head.

Umtali District.—No fresh outbreaks. At the Maonza infected centre two head were destroyed on suspicion.

CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

Prevalent in the Plumtree district. Also reported from the Gwanda, Belingwe, Hartley, Salisbury, Lomagundi and Melsetter districts.

TRYPANOSOMIASIS.

Two head of cattle died on a farm in the Melsetter district, where tsetse fly is not found. A considerable

mortality in cattle reported from the Lomagundi and Hartley districts.

SPIROCHÆTOSIS.

In the Melsetter district a recently imported bull was found to be infected.

IMPORTATIONS.

From Union of South Africa:—Bulls, 3; heifers, 58; horses, 32; mules, 7; donkeys, 28; goats, 304; sheep, 779; pigs, 19.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle for consumption in Union, 1,957. To Union of South Africa for export to Europe via Durban, 5,943. To Union of South Africa for export to Europe via Johannesburg, 216. To Belgian Congo:—Slaughter cattle, 846; sheep, 105; pigs, 20. To Northern Rhodesia:—Horse, 1; donkeys, 17; goats, 30; sheep, 115; pigs, 145. To Union of South Africa:—Horses, 2; pigs, 58. To Portuguese East Africa:—Slaughter cattle, 24; trek cattle, 16; bulls, 2; sheep, 70.

October, 1926.

AFRICAN COAST FEVER.

UMZINGWANE DISTRICT.—At the Essexvale east section infection was found in several plots in the vicinity of plot 50, where the disease was discovered in September. The mortality during the month was 38 head. A very heavy mortality occurred on the Essexvale south section. During the month 1,418 head were moved to temperature camps on clean or lightly infected veld. The total mortality during the month, including animals destroyed at the temperature camps, was 1,085 head.

MATOBO DISTRICT.—No fresh outbreaks occurred. The mortality in the infected herds was 57 head. During the month 149 head were moved from the infected farm Malaje to clean veld on the adjoining farm Manyoni.

UMTALI DISTRICT.—At the infected farm Maonza a yearling was destroyed on showing a rise of temperature. Microscopic examination showed the existence of Coast Fever.

GWELO DISTRICT.—On the 2nd of October a beast died on the farm Clearwater, adjoining Hunter's Road siding, and the owner, thinking that the kidneys were suspicious of Coast Fever, forwarded them to the district veterinary surgeon, Gwelo. The existence of Coast Fever was demonstrated microscopically. The infected herd was temperatured daily, and up to the end of the month no further case was detected. In April, 1919, a virulent outbreak occurred on this farm and a heavy mortality resulted. The last recorded case of Coast Fever was on 6th June, 1920, and the farm was released from quarantine on 28th October, 1921, so that the period between this case and the last known case was six years and four months. During this period the farm was regularly inspected and nothing ever found amiss. Except for a few cases of gall-sickness in 1923, which were investigated by the district veterinary surgeon, there was no abnormal mortality at any time. It seems incredible that under these conditions infection should remain active for over six years. If, on the other hand, infection was introduced from elsewhere, it is a singular coincidence that it should have been dropped on Clearwater.

CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

Reported as prevalent in a number of inspectorates throughout the Colony.

CONTAGIOUS OPHTHALMIA OF CATTLE.

Prevalent in various inspectorates in Mashonaland.

TRYPANOSOMIASIS.

In the Hartley and Lomagundi districts the mortality in cattle was considerable. Two head of cattle died on a farm in the Melsetter district, where tsetse fly is unknown. The district veterinary surgeon observes that where infected animals are allowed to run with the herd until death occurs, no further spread of infection in these herds takes place, and suggests that this points to cyclical and not mechanical transmission.

VEGETABLE POISONING.

The district veterinary surgeon, Umtali, reports a number of deaths in cattle which he thinks may have been due to bracken poisoning.

ANTHRAX.

An outbreak of anthrax occurred on Reserve and the Ntabazinduna Native Reserve in the Bubi district. Six head of cattle succumbed and all in-contacts were vaccinated. This is the third instance in which anthrax has been recorded in Matabeleland; the first was at Ramaquabane in 1898 and the second at Umganin, near Bulawayo, in 1912.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 87; cows and heifers, 93; horses, 35; mules, 62; donkeys, 9; goats, 435; sheep, 946; pigs, 12.

EXPORTATIONS.

To the Union of South Africa:—Slaughter cattle for consumption in the Union, 1,542; slaughter cattle for export overseas via Durban, 5,079; slaughter cattle for export overseas via Johannesburg, 31; horses, 1; pigs, 99. To Belgian Congo:—Slaughter cattle, 637; pigs, 195. To Northern Rhodesia:—Horses, 2. To Portuguese East Africa:—Cattle (mixed), 83.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Review.

"Chemistry for Agricultural Students," by R. H. Adie, M.A., B.Sc. (Tutorial Press: 5s. 6d.)

The applications of chemistry to agriculture are so manifold that it is difficult to treat of them effectively in a small work of 350 pages, and the degree of success achieved by the author is very creditable. The work is intended for students of agriculture, and includes a large number of experiments to be performed in the laboratory. It will not therefore make any particular appeal to the average farmer.

If carefully studied, with occasional reference to more comprehensive works, it should enable the general agricultural student to get a good grip of the salient principles, and enable him to appreciate the work of the more specialised scientist.

It seems, however, questionable as to whether the work is not too much on the elementary side. One would have expected that students who are to specialise in agriculture would have already covered a certain amount of the ground treated, and that the space given to such subjects as specific gravity, air, Boyle's law, water, etc., might have been better employed in a fuller discussion of matters more definitely connected with agricultural theory and practice.

A. W. F.

Export of Tobacco.

The Government of this Colony have been able to arrange with the Conference shipping lines for alternate rates to be charged on tobacco shipped to England. Thus, in future, tobacco from Beira will be charged 50s. per 40 cubic feet or 9/16d. at shipper's option, both rates being subject to the usual 10 per cent. deferred commission.

Southern Rhodesia Weather Bureau.

NOVEMBER, 1926.

Pressure.—During the month the mean barometric pressure was below normal in the west and above normal in the east, varying from 0.045 in. below normal at Livingstone to 0.036 in. above normal at Umtali. The extreme fluctuations in pressure during the month varied from 0.34 in. at Fort Victoria to 0.15 in. at Salisbury. Four low pressure systems affected the local pressure during the month. The centres of these depressions were nearest this country on the 2nd, 8th, 24th and 29th; the period between the 8th and the 22nd was marked by high pressure. Four high pressure systems affected Rhodesia during the month on the 5th, 6th, 16th, 26th and 30th; of these, those of the 5th, 6th and the 30th actually entered the country in the south. A deep low was off the south-east coast on the 1st and moved up opposite Beira on the 2nd, where it appeared shallow. On the 3rd it was again off Durban, and from there moved off east. A southerly low moved up to the south of Rhodesia on the 5th and 6th and then faded. A southerly low was central in the interior of the Union during the 5th, 6th and 7th; it intensified off the south-east coast on the 8th and then moved off east, followed by a southerly high on the 9th and 10th. Lows were in evidence in the interior of the Union on the 11th, 12th, 13th, 14th and 16th, with little effect on Rhodesian pressure. A southerly high, however, on the 16th and 17th came close to our southern border. A southerly high appeared in the south-west of the Union on the 21st, was off the south coast on the 22nd, intensified off the east coast on the 23rd, and moved up the coast on the 24th, and thence to the east, followed by a southerly high on the 26th off the coast. A northerly low appeared on the 25th, moved to the interior of the Union on the 26th, intensified off the east coast on the 27th and 28th, and was off Beira on the 29th, but was filling up. A

southerly high off the south coast on the 29th appeared in our southern border on the 30th.

Temperature.—During the month the mean temperatures were generally above normal, varying from 3.2° F. above normal at Wankie and Tuli to 2.6° F. below normal at Riverdene North. The mean day temperatures were generally above normal, varying from 8.4° F. above normal at Tuli to 5.7° F. below normal at Riverdene North. The mean night temperatures were about normal, varying from 2.7° F. above normal at Wankie to 1.9° F. below normal at Tuli. The highest shade temperature recorded was 119° F. at Tuli. The relative humidity was generally below normal, varying from 11 per cent. below normal at Enkeldoorn to 4 per cent. above normal at Umtali.

Rainfall.—The mean rainfall over the country amounted to 1.85 ins. as compared with a normal of 3.28 ins. The seasonal total amounts to 2.59 ins., as compared with a normal of 4.86 ins. November rainfall has been below the present value on several occasions—1894, 1905, 1911, 1912, 1915, 1917, 1920, 1923. The mean rainfall as recorded in the various zones is as follows:—

	November, 1926. Inches.	Normal, November. Inches.
Zone A (western Matabeleland)	1.69	3.10
Zone B (south-eastern Matabeleland)	1.55	2.55
Zone C (western Mashonaland)	1.59	3.51
Zone D (north-eastern Mashonaland)	1.69	3.74
Zone E (south-eastern Mashonaland)	2.61	3.63
Zone F (eastern border)	3.35	5.07

From the above it will be noted that the deficiency was fairly general, but most marked in Zones C and D.

In Zone A the district with the greatest mean rainfall was Sebungwe, with 2.06 ins.; and the district with the least was Gwelo, with 0.49 in.

In Zone B the district with the greatest mean rainfall was Bulalima-Mangwe, with 2.24 ins.; and the district with the least was Chibi, with 0.73 in.

In Zone C the district with the greatest mean rainfall was Charter, with 2.18 ins.; and the district with the least was Lomagundi, with 1.43 ins.

In Zone D the district with the greatest mean rainfall was Marandellas, with 4.34 ins.; and the district with the least was Mrewa, with 1.21 ins.

In Zone E the district with the greatest mean rainfall was Inyanga, with 6.42 ins.; and the district with the least was Insiza, with 0.86 in.

In Zone F Melsetter had 3.46 ins. and Umtali had 3.39 ins.

Rain Periods.—On the 1st isolated showers were reported. On the 2nd numerous showers were reported between Bulawayo and Salisbury. On the 3rd showers in Matabeleland and south-western Mashonaland. On the 4th showers in south-eastern Mashonaland and south-eastern Matabeleland. On the 5th light showers from the south-east. On the 6th and 7th isolated showers only reported. On the 8th showers reported from centre of country. On the 9th showers reported from north-eastern Mashonaland and eastern border. The 10th was fine. On the 11th showers in north-eastern Mashonaland. On the 12th showers in north-eastern Mashonaland. The 13th and 14th were fine. On the 15th showers reported in south-eastern Mashonaland and eastern border. On the 16th showers reported in north-eastern Mashonaland only. The 17th and 18th were fine. On the 19th showers on eastern border. On the 20th and 21st isolated showers. On the 22nd showers in north-eastern Mashonaland and south-eastern Matabeleland. On the 23rd isolated showers in north-eastern Mashonaland. On the 24th scattered showers. On the 25th rain fairly general. On the 26th fairly general rain. On the 27th and 28th light showers fairly general, except in west. On the 29th showers fairly general. On the 30th showers in north-eastern Mashonaland.

RAINFALL.

Station.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	.90	1.11	2 54	4.06
Imbesu Kraal ...	...	...	...	4.23
Inyati ...	.39	1.28	1.67	4.34
Judsonia ...	.77	1.30	2.07	n.s.
Martha Farm ...	1.39	1.54	2.93	n.s.
Shangani Estate ...	.12	2.59	2.76	4.00
Bulalima Mangwe—				
Centenary ...	.64	1.69	2.33	n.s.
Kalaka ...	1.51	1.37	...	3.97
Riverbank ...	.54	1.03	1.57	4.07
Solusi Mission ...	.88	.99	1.87	4.24
Bulawayo—				
Fairview Farm ...	.18	1.55	2.36	3.88
Keendale ...	.21	2.00	2.28	3 82
Lower Rangemore ...	.31	1.42	2.57	4.13
Observatory ...	.03	1.25	1.65	4.23
Gwelo—				
Dawn ...	nil	nil	nil	4.36
Delano Estate ...	.17	.89	1.35	n.s.
Gwelo Gaol ...	.51	.72	1.69	4.62
Riversdale Estate ...	1.41	nil	2.76	n.s.
Somerset Estate ...	.38	.82	1.38	4.42
Insiza—				
Orangedale ...	nil	2.14	2.39	4.90
Shangani ...	.05	1.30	1.35	4.09
Thornville ...	.03	2.37	2.51	4.36
Nyamandhlovu—				
Edwaleni ...	...	...	...	4.08
Gwaai Reserve ...	...	.75	...	n.s.
Impondeni ...	.23	1.19	1.42	n.s.
Naseby ...	.44	2.57	3.01	4.88
Nyamandhlovu Railway ...	nil	.46	.46	3.97
Sebungwe—				
Gokwe ...	.05	2.06	3.25	4 98
Umzingwane—				
Springs ...	.23	1.77	2.10	4.26
Wankie—				
Matetsi Railway ...	.87	2.70	3.57	5.21
Ngamo Railway ...	.32	1.31	1.83	5.04
Sukumi ...	.31	1.04	2.85	n.s.
Victoria Falls ...	.30	2.75	3.05	4.88
Wankie Hospital ...	.80	1.35	3 63	2.40
Waterford ...	.59	3.04	3.63	...
Zone B.:				
Belingwe—				
Bickwell ...	.28	.65	1.01	4.28
Bulalima-Mangwe—				
Bruwapeg ...	.30	3.03	3.67	n.s.
Edwinton ...	.65	1.63	2.28	4.00

RAINFALL—(*Continued*).

Station.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	.30	2.28	2.58	3.88
Garth ...	1.82	2.22	4.19	4.57
Maholi ...	.91	2.05	3.01	4.19
Retreat ...	.94	...	...	3.96
Sandown ...	.43	.91	1.34	n.s.
Semokwe Reserve ...	.23	3.73	3.96	n.s.
Tjankwa ...	.55	2.70	3 25	4.39
Tjompanie ...	1.24	1.60	2.84	4.18
Chibi—				
Nuanetsi Homestead ...	nil	.73	1.03	2.87
Gwanda—				
Antelope Mine ...	.24	2.60	4.17	3.63
Gwanda Gaol ...	.03	1.06	1.97	3.80
Limpopo ...	nil	2.29	3.52	n.s.
Mazunga ...	...	...	...	2.97
Tuli ...	...	...	...	2.58
Insiza—				
Albany ...	.08	1.85	2.03	4.05
Filabusi ...	nil	1.06	1.13	3.88
Fort Rixon ...	,,	1.10	1.17	4.05
Inyezi	,,	.63	.70	3.96
Lancaster ...	,,	1.70	1.90	n.s.
Wanezi Mission ...	,,	.79	.79	n.s.
Matobo—				
Bon Accord ...	,,	1.12	1.83	n.s.
Fort Usher ...	1.62	.92	3.06	n.s.
Holly's Hope ...	.72	2.41	4.51	3.92
Longsdale ...	.37	1.56	1.93	n.s.
Matopo Mission ...	nil	.91	...	4.78
Matopo School ...	...	...	...	n.s.
Mtshabezi Mission ...	.09	.45	1.70	4.02
Rhodes Matopo Park ...	.29	1.11	1.78	4.32
Wenlock Ranch ...	.06	1.34	3.21	n.s.
Umzingwane—				
Balla Balla ...	.12	.78	...	4.35
Essexvale ...	.36	1.74	3.43	4.24
Heany Junction ...	3.67	1.90	6.07	4.71
Hope Fountain ...	.10	...	...	4.62
ZONE C.:				
Charter—				
Bushy Park ...	nil	1.78	1.98	4.95
Enkeldoorn ...	,,	1.68	1.76	5.09
Marshbrook ...	,,	3 08	3.26	4.90
The Range ...	...	3.00	...	5.26
Vrede ...	...	...	...	4 91
Chilimanzi—				
Beacon Hill ...	.08	1.40	1.78	n.s.
Central Estates ...	.12	1.34	1.97	5.16

RAINFALL—(*Continued*).

STATION.		1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)					
Chilimanzi (continued)—					
Fourie's Post	...	.20	...	...	n.s.
Orton's Drift	...	nil	1.42	1.58	5.16
Sebakwe Post	...	,,	2.33	2.43	n.s.
Umvuma Railway	...	,,	1.59	...	4.76
Gwelo—					
Cross Roads	...	nil	1.10	1.53	4.55
East Clare Ranch	...	,,	.95	1.02	n.s.
Globe and Phœnix Mine	...	.08	1.12	1.50	4.71
Indiva	...	nil	1.49	1.66	n.s.
Iron Mine Hill	...	.90	2.29	4.11	n.s.
Lyndene	...	nil	1.53	2.24	n.s.
Lannes Farm	...	.20	1.39	2.07	n.s.
Rhodesdale Ranch	...	.65	1.56	3.41	4.64
Woodendhove	...	1.20	3.09	...	4.93
Hartley—					
Ardgowan	...	.10	1.50	1.73	5.32
Balwearie	...	.27	.56	.94	n.s.
Battlefields	...	nil	1.08	1.08	4.84
Beatrice	...	,,	2.73	3.54	5.49
Carnock	...	.06	3.44	3.50	5.32
Cromdale	...	.01	2.26	2.31	n.s.
Deweras Store	...	.31	1.47	1.81	n.s.
Eiffel Blue Mine	...	.10	1.06	1.16	n.s.
Elvington	...	nil	1.58	1.62	5.24
Gatooma	...	.05	1.78	1.83	5.37
Gatooma Experiment Station		.10	.80	1.14	n.s.
Gowerlands	...	nil	2.85	4.19	5.04
Handley Cross	...	.43	1.23	1.66	n.s.
Hartley Gaol	...	.01	.80	1.14	5.22
Hopewell	...	nil	1.75	1.75	5.39
Jenkinstown	...	,,	2.93	3.02	5.26
Maida Vale	...	,,	.28	.28	n.s.
Nyadgori	...	,,	1.99	1.99	n.s.
Palham	...	,,	3.07	3.08	5.58
Ranwick	...	,,	.75	.75	5.21
Rocky Spruit	...	,,	2.70	3.10	n.s.
Thornby	...	...	...	...	4.97
Thorndyke	...	nil	1.14	1.64	n.s.
Lomagundi—					
Argyle	...	.25	.89	1.34	4.92
Baguta	...	.16	...	...	5.05
Between Rivers	...	nil	1.45	2.14	n.s.
Tsanunu	...	...	...	...	n.s.
Citrus Estate	...	.49	.78	1.34	4.78
Darwendale	...	.37	...	...	4.96
Debera	...	.50	3.74	...	n.s.
Devonia	...	.51	1.44	2.00	4.85
Dingley Dell	...	...	.12	...	n.s.
Elinda	...	...	...	...	n.s.
Gambuli	...	.71	1.11	1 89	5.38

RAINFALL—(*Continued*).

STATION.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi (continued)—				
Gudubu ...	...	...	...	n s.
Impingi ...	.05	1.58	...	n.s.
Kapiri ...	nil	3.58	3.58	n.s.
Lone Cow Estate ...	,,	2.56	2.57	5.08
Mafoota ...	...	.38	...	n.s.
Maningwa ...	.03	.84	.87	4.93
Mica Field ...	nil	1.02	1.19	n.s.
Montrose ...	.35	.83	1.29	n.s.
Mpandegutu ...	.02	1.22	1 37	n.s.
Mukwe River Ranch ...	.12	...	...	4.64
North Banket ...	nil	1.48	2.01	n.s.
Nyapi ...	.40	1.30	1.77	n.s.
Nyarora ...	1.14	2.38	3.79	n.s.
Nyati ...	.32	.62	.99	n.s.
Palm Tree Farm ...	nil	...	...	4.93
Puri ...	1.00	.79	...	n.s.
Raffingora ...	.25	2.15	2 70	...
Richmond ...	.15	1.91	2.12	...
Robbsdale ...	nil	1.78	1.89	...
Romsey ...	.83	1.37	2.21	..
Silater Estate ...	nil	.56	...	...
Sinoia ...	,,	1.66	1.82	4.98
Sinoia's Drift ...	.27	.52	1.12	n.s.
Sipolilo ...	.15	2.40	2.70	4.86
Umboe ..	nil	.27	.27	n.s.
Umvukwe Ranch ...	.12	1.41	1.61	4.94
Woodleigh ...	.02	2.03	2.29	n.s.
Yeanling ...	.15	1.82	2.12	n.s.
Salisbury—				
Avondale (Broadlands) ...	.11	1.33	1.65	5.17
Ballineety ...	nil	3.07	3.28	n.s.
Botanical Experiment Station	.11	.82	1.16	5.07
Bromley ...	nil	1.81	2.12	5.33
Cleveland Dam ...	.19	2.20	3.95	5.05
Gwebi ...	.15	2.64	2.97	5.21
Hillside ...	.03	1.21	1.50	3 55
Lochinvar ...	.27	1.69	2.08	4.76
Manor Farm ...	.30	1.77	...	n.s.
Pendennis ...	.14	.71	.95	...
Salisbury Agricultural Dept.	.14	1.28	1.49	...
Sebastopol ...	.05	2.12	2.22	5.33
Selby ...	...	...	..	n.s.
Stapleford ...	nil	3.16	3.37	5.50
Tobacco Experiment Station	.10	1.37	...	n.s.
Vainona ..	.17	.89	1.17	5.38
Western Commonage ...	.38	2.77	3.26	5.38
Sebungwe—				
Sikombela ...	.32	1.76	2.08	5.23
Wolverley ...	.07	...	...	n.s.

RAINFALL—(*Continued*).

STATION.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	nil	1.92	1.92	n.s.
Fountains ...	.25	.90	...	n.s.
Mount Darwin ...	...	...	...	4.73
Rusambo ...	.29	1.85	2.14	n.s.
Inyanga—				
Inyanga ...	.24	2.18	...	5.81
Juliasdale ...	...	...	...	n.s.
Rhodes Estate ...	.15	3.75	5.01	6.44
Makoni—				
Ardlamont ...	nil	3.75	...	n.s.
Eagle's Nest ...	,,	4.94	4.94	5.19
Mayo Ranch ...	,,	nil	nil	n.s.
Nyogeni ...	...	...	...	n.s.
Kelvin ...	...	...	...	n.s.
Wensleydale ...	...	...	...	n.s.
Marandellas—				
Fault Farm ...	nil	4.34	4.44	n.s.
Mazoe—				
Argyle Park ...	.21	2.34	2.60	n.s.
Atherstone ...	...	...	...	n.s.
Bellevue ...	nil	1.58	1.58	n.s.
Benridge ...	...	...	...	n.s.
Bindura ...	.44	.52	1.16	5.18
Ceres ...	.24	1.91	2.29	5.57
Chipoli ...	.27	.61	1.08	4.96
Citrus Estate ...	.96	1.88	2.89	5.03
Craigengower ...	.69	.47	1.25	4.85
Dandejena ...	.14	1.18	1.34	n.s.
Donje ...	.21	1.49	1.87	n.s.
Dundry ...	...	...	...	n.s.
Frogmore ...	.17	.75	1.11	n.s.
Glen Divis ...	.34	1.63	1.97	n.s.
Glen Grey ...	.14	1.03	1.31	n.s.
Hinton ...	...	1.32	...	n.s.
Great B ...	nil	...	...	n.s.
Kilmer ...	.42	.64	1.13	4.98
Kingston ...	.37	2.00	2.42	5.57
Mazoe ...	.05	1.56	1.61	5.07
Maienzi ...	...	1.21	...	n.s.
Marston ...	.25	.10	.35	n.s.
Mgutu ...	nil	1.77	1.77	n.s.
Muripfumba ...	.40	1.33	1.73	n.s.
Omeath ...	.27	1.44	1.73	4.89
Pearson Settlement ...	nil	2.88	2 88	n.s.
Pembi Ranch ...	.05	1.84	...	n.s.
Riversdale Estate ...	nil	1.20	1.20	n.s.
Ruia ...	.06	1.76	1 85	5.48
Ruoko Ranch ...	...	...	...	5.02
Rustington ...	nil	.83	.83	n.s.
Shamva Mine ...	.69	1.58	2.49	5.17

RAINFALL—(*Continued*).

STATION.		1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)					
Mazoe (continued)—					
Stanley Kop	...	nil	2.42	2.42	4.81
Sunnyside	...	...	1.69	...	5.10
Teign	...	.09	1.19	1.43	n.s.
Usk	...	nil	1.75	2.02	5.55
Vergenoeg	...	...	...	...	n.s.
Virginia	...	.13	.81	1.04	4.77
Visa	...	.20	...	...	n.s.
Woodlands	...	.28	1.14	1.42	5.10
Zombi	...	.18	1.60	1.99	5.02
Mrewa—					
Glen Somerset	...	...	.78	...	5.18
Mrewa	...	.04	1.64	1.78	5.41
Selous Nek	...	...	...	...	5.18
Mtoko—					
Makaha	...	.18	.68	.95	4.89
Mtoko	...	.45	3.02	...	4.30
Nyaderi Mission	...	.36	2.51	3.11	n.s.
Salisbury—					
Arcturus	...	nil	1.23	1 90	5 69
Calgary	...	.11	1.29	...	n.s.
Chindamora Reserve	...	.20	1.64	1.84	n.s.
Chinyika	...	.10	1.84	2.97	n s.
Glenara	...	nil	1.45	1.45	4.86
Goromonzi	...	.05	1.75	1.81	5.90
Hatcliffe	...	.07	.86	.93	n.s.
Hillside (Bromley)	...	nil	2 14	3.39	n.s.
Kilmuir	...	,,	1.87	2.26	n.s.
Meadows	...	.06	.98	1.11	5.87
Selby	...	.03	2 26	2.52	4.71
Springs	...	nil	.95	1.14	n.s.
Teviotdale	...	...	...	...	n.s.
ZONE E.:					
Belingwe—					
Belingwe (N.C.)	...	nil	.94	...	4.24
Doro	...	.15	.77	1.17	n.s.
Shabani	...	nil	.96	.96	n.s.
Bikita—					
Angus Ranch	...	.03	1.47	1.67	4.34
Bikita	...	nil	1.11	2.05	n.s.
Devuli Ranch	...	...	...	...	n.s.
Charter—					
Buhera	...	nil	4 13	4.80	6 30
Chibi—					
Chibi	...	nil	3.28	3.46	4.24
Lundi	...	,,	2.46	3.96	3.86
Chilimanzi—					
Alanberry	...	.04	1.97	2.16	4.58
Driefontein	...	.21	1.02	1.39	4 94
Felixburg	...	nil	1.53	1.53	5 43

RAINFALL—*(Continued)*.

STATION.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Chilimanzi (continued)—				
Grootfontein ...	.10	.84	.94	5.24
Induna Farm ...	.16	1.49	1.73	5.71
Mtao Forest ...	nil	...	...	n.s.
Requeza Estate ...	.16	...	...	n.s.
Thornhill ...	.49	1.80	2.40	n.s.
Gutu—				
Alheit Mission ...	.23	...	...	4 21
Chindito ...	.33	2.31	3.00	5.85
Eastdale Estate ...	.06	3.52	3.71	5.74
Gutu ...	.18	3.33	5.31	5.45
Glenary ...	.03	2.18	2.51	4.67
Gwelo—				
Glencraig ...	.09	1.10	...	n.s.
Partridge Farm ...	.06	2 63	3.19	6.41
Sheep Run Farm ...	.27	2.37	3.32	5.37
Inyanga—				
Dungarven ...	...	...	...	n.s.
St. Trias' Hill ...	.20	6.42	6.90	6.92
Insiza—				
Roodeheuvel ...	...	.86	...	4.77
Makoni—				
Craigendoran ...	.06	3.38	3.62	5.29
Forest Hill ...	.49	3.56	4.16	5.58
Gorubi Springs ...	.05	7.27	7.35	5.67
Inyagura ...	nil	4.55	4.55	n.s.
Makoni Kop ...	.10	3.67	3.77	n.s.
Mande ...	...	...	...	n.s.
Mona ...	.01	3.34	3.38	6.20
Monte Cassino ...	nil	2.98	3 31	6.23
Romsley ...	...	...	...	n.s.
Ruati ...	.38	3.81	4.37	n.s.
Rusape ...	.04	5.37	5.41	5.45
Tablelands ...	.25	3.61	4.10	n.s.
Tsungwesi Ranch ...	...	...	...	n.s.
Springs ...	.01	7.29	7.33	5.61
Whitgift ...	.02	2.53	2.74	n.s.
Marandellas—				
Benongwe ...	nil	3.51	3.71	5.80
Delta ...	,,	2.03	2.03	5.75
Elandslaagte ...	,,	5.42	5.42	n.s.
Land Settlement ...	...	2.92	...	5.79
Lendy Estates ...	nil	1.59	1.59	6.20
Lushington ...	,,	...	...	n.s.
Macheke ...	,,	2.70	2 75	6.32
Marandellas ...	,,	4.17	4.34	6.58
Nelson ...	,,	5.35	5.43	5.18
Tweedjan ...	,,	5.28	5.43	6.18
Wenimbi ...	.51	7.14	7.65	n.s.
White Gambolo Ranch ...	nil	4.56	4.56	n.s.

RAINFALL—(*Continued*).

Station.	1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(continued)				
Melsetter—				
Brackenbury ...	...	...	...	9.44
New Year's Gift ...	.40	1.84	2.91	n.s.
Tom's Hope ...	.22	4.12	5.49	8.66
Ndanga—				
Doornfontein ...	.04	.93	1.28	4.71
Manjirenji ...	nil	...	...	n.s.
Marah Ranch ...	...	1.63	...	5.62
Zaka ...	nil	2.40	2.56	6.92
Selukwe—				
Aberfoyle Ranch ...	.02	.78	1.03	5.62
Danga ...	...	...	...	n.s.
Hillingdon ...	nil	1.13	2.05	5.66
Impali Source ...	.08	.92	1.43	n.s.
Rio ...	.06	2.63	2.87	5.30
Safago ...	.16	1.59	2.44	5.84
Selukwe Gaol ...	...	...	...	n.s.
Tokwe Block ...	nil	...	...	n.s.
Woodlands ...	,,	1.10	1.10	n.s.
Umtali—				
Alicevale ...	.29	2.13	2.42	5.63
Argyll ...	.06	2.99	3.30	5.60
Embeza ...	.86	6.82	10.59	n.s.
Fairview ...	1.58	3.35	4.93	n.s.
Fern Valley ...	.03	2.71	3.35	n.s.
Forest Farm ...	nil	...	...	n.s.
Jerain ...	.12	2.19	2.71	5.74
Mutambara Mission ...	.78	2.21	3.29	5.29
Odzani Power Station ...	.33	2.22	2.95	6.51
Park Farm ...	.37	2.90	4.25	n.s.
Premier Estate ..	.12	2.09	2.42	5.49
Sarum ...	nil	2.15	2.15	5.08
Stapleford ...	.23	7.71	11.30	12.75
St. Augustine's Mission ...	.67	3.28	4.90	n.s.
Transsau Estate ...	.15	3.61	3.90	n.s.
Umtali Gaol ...	.15	2.23	2.97	5.86
Victoria—				
Bruceshame ...	nil	.84	1.16	4.97
Cambria ...	.10	1.69	1.90	n.s.
Cheveden ...	nil	2.34	3.21	n.s.
Clipsham ...	.04	1.20	1.47	5.08
Gokomere ...	.12	2.20	2.50	5.16
Makowries ...	.22	1.62	2.00	n.s.
Mashaba ...	.04	1.57	1.61	n.s.
Miltonia ...	.05	2.41	2.67	n.s.
M'Sali ...	.07	1.58	2.13	n.s.
Riverdene North ...	.19	1.08	1.48	5.24
Salemore ...	...	...	...	n.s.
Silver Oaks ...	nil	1.83	2.29	5.19
Stanmore ...	.09	.73	...	n.s.
Victoria ...	nil	1.39	1.39	4 71
Zimbabwe ..	,,	3.31	4.60	n.s.

RAINFALL—(*Continued*).

STATION.		1926. Oct.	1926. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE F.:					
Melsetter—					
Chikore	...	.79	2.85	5.52	7.54
Chipinga	...	.16	3.09	...	7.80
Lettie Swan	...	.30	4.49	6.39	n.s.
Melsetter	...	.31	2.61	4.27	8.26
Mount Selinda	...	.22	1.82	5.84	10.96
Springvale	...	.15	3.50	...	n.s.
Vermont	...	.33	5.86	9.89	11.30
Umtali—					
Chimeze	...	.87	3.39	5.63	n.s.
Hoboken	...	...	...	...	n.s.

Export of Cattle from Southern Rhodesia, 1926.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
	Johannesburg	I.C.S. for overseas	On hoof							
January ...	437	...	...	898	...	...	...	...	...	1,335
February ...	679	4,292	...	170	...	...	...	...	...	5,141
March ...	872	4,484	...	...	...	...	...	...	...	5,356
April ...	545	3,877	...	1,227	795	15	...	...	...	6,441
May ...	812	3,521	180	1,233	185	...	...	...	...	5,931
June ...	1,056	5,539	...	967	1,647	17	12	...	...	9,288
July ...	1,606	8,153	...	428	51	...	61	14	...	10,313
August ...	1,958	6,902	...	1,319	127	...	126	66	...	10,498
September ...	1,975	6,159	...	846	...	...	62	16	2	9,060
October ...	1,542	5,110	...	637	...	...	83	...	...	7,372
November ...	431	1,537	130	279	24	...	68	...	...	2,469
December ...										

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Jan.	Feb.
			1927	1927
Ayrshire—Sipolilo	Jan. meeting, Mafuta (M. Mitton)	G. H. Cautherley	8	...
Banket Junction	Various farms	C. C. K. Anderson	1	5
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	27	24
Bindura	Bindura Farmers' Hall	W. E. Fricker	8	12
Bromley	Farmers' Hall, Bromley Siding	J. H. Shirley	5	2
Bubi	Queen's Mine	E. C. Gondin	11	8
Chakari	Various farms	L. T. Tracey	20	17
Chatsworth	Makowries Farm	A. W. White	1	...
Concession (Mazoe)	Concession Hotel	Frank Allen	11	8
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	8	12
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	6	3
Enterprise	Farmers' Hall	John Johnstone	3	7
Essexvale	Essexvale	W. H. V. Hoste	16	20
Felixburg—Gutu	Various Farms	C. L. Burrows	...	12
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	4	1
Gadzema	Gadzema	Hugh G. Williams	9	13
Gatooma	Speck's Hotel	C. M. Davenport	15	19
Gazaland	Court House, Chipinga	D. M. Stanley	3	7
Greystone	Quarrie Farm	C. B. Liebenberg	8	...
Gwanda	Various farms	N. B. Nilson	...	...
Hartley	Old School Room, Hartley	J. de L. Nimmo	21	18
Headlands	Headlands	J. A. Eve	...	...
Insiza—Shangani	Shangani Hotel	K. Carlsson	...	...
Insiza South	Farm Lancaster	J. Campbell	13	10
Inyanga	Inyanga	E. J. Hacking	8	12
Inyazura	Inyazura	D. de Kock	...	4
Lalapansi	Lalapansi	E. Buckley	8	12
Lomagundi	Sinoia	F. W. Robertson	7	...
Lomagundi West	Various farms	E. Morton	16	13
Macheke	Macheke	M. J. Palmer	8	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	2	6

Makwiro	Makwiro	F. H. Howard	21	18
Makoni	Rusape	J. G. Monckton	8	12
Marandellas	Marandellas Farmers' Hall	C. A. Elliot	7	4
Marandellas, Southern	Various farms	M. C. Myers	5	2
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	14	11
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A. Carnegie	13	10
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	15	19
Mazoe (Glendale)	Farmers' Hall, Glendale	M. Graham	12	9
Melsetter	Court House, Melsetter	Dr. Rose	13	10
Melsetter (North)	Cronley	R. Wodehouse	Not	received
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	12	9
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	29	26
Northern Umtali	Farm Summerfield	A. Tulloch	Not	received
North Umniati	———	J. F. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	7	4
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	1	5
Poorte Valley	Various places	J. Norton Thompson	15	19
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	15	19
Salisbury South	Various farms	P. Linton	26	23
Selukwe	The Hotel, Selukwe	W. T. Simpson	7	4
Shamva	Shamva Hotel	E. Butler	20	17
Two Rivers Farming Association	Various farms	W. M. Parsons	8	12
Umboe (Branch of Lomagundi F.A.)	Various farms	A. J. Hawkes	8	12
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Lieut.-Col. W. M. Royston Pigott	15	12
Umtali	Drill Hall, Umtali	A. Howat	6	3
Umvuma and District	Umvuma	N. B. Colling	Not	received
Victoria	Victoria	H. Payne	14	11
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	E. F. Willmore	12	9
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

January.

BEE-KEEPING.

Where it is desirous, artificial swarms can now be made, so also can nuclei be formed from proved best working strains. All the above must be stimulated with food. In the cooler districts it will be necessary to contract the entrances and close down for winter.

CROPS.

Cultivation of crops sown in November-December will continue, and land still awaiting seeding will usually require to be harrowed or disc harrowed between rains to catch and destroy germinating weeds while still young. Hay crops, such as Sudan grass, teff, manna and other millets, summer oats and ensilage crops, such as maize, maize and velvet beans, except on farms liable to serious stalk-borer infestation, may still be sown, preferably during the early part of the month. For green manuring, cow-peas, Sunn hemp and Niger oil may still be put in. Kudzu vine and grasses such as Napier fodder and Kikuyu should be planted out with the steady rains.

Short season crops, such as buckwheat, haricot beans of various kinds, Tepary beans and field peas, are often sown during this month, and the time is yet opportune to put in the main potato crop.

January is the month when weeds, if neglected, get ahead of the farmer, and the principal work will be the continued cultivation of all crops planted in drills. Neglect of thorough cultivation entails additional expense in hand hoeing.

ENTOMOLOGICAL.

Maize.—This crop is subject to the attack of stalk borer, maize beetle (Heteronychus), snout beetles, grasshoppers, crickets, etc. See "Agricultural Journal," April 1919. Maize planted after the first of the year is extremely liable to almost complete failure as a crop from the second brood of the stalk borer. See "Agricultural Journal," December, 1917. This is of less importance in regard to ensilage.

Tobacco.—Most of the pests of this crop are active during January, e.g., stem borer, leaf miner, "wireworms," surface beetles, large crickets, grasshoppers, etc. See "Agricultural Journal," December, 1919, February, 1920.

Potato.—Certain ladybirds are apt to defoliate the young potato plants of the main crop, especially on farms where early potatoes are also grown. See "Agricultural Journal," October, 1913. Blue blister beetles are apt to be injurious on sandy soils, and may be checked by spraying with arsenate of lead, 1 lb. to 12 gallons of water. Spraying should be commenced for early blight. See "Agricultural Journal," August, 1913.

Cabbage Family.—Plants of this family are subject to the attacks of webworm and saw fly in January. See "Agricultural Journal," February, 1914, April, 1910, April, 1917, June, 1918.

Beans and Cowpeas.—These suffer chiefly from stem maggot. See "Agricultural Journal," April, 1913. On small plots aphis may be checked by spraying with tobacco wash or paraffin emulsion.

Melon Family.—The chief pests in January are leaf-eating beetles. Spray with an arsenical wash or cover young plants.

Citrus Trees.—The fruit is subject to the attack of citrus codling. Collect and destroy the infested fruits. For this and other citrus pests see "Agricultural Journal," February, 1916.

Deciduous Fruits.—These are all subject to the attack of fruit-eating beetles. See "Chafer Beetles," "Agricultural Journal," December, 1914. Fruit moths are injurious during this month, the only preventive measure being to net the trees. For fruit fly remedies, see "Agricultural Journal," August, 1911.

Fig.—The adult beetles of the fig borer are to be found on the young shoots. They should be destroyed. The grubs in the stems may be killed with a little carbon di-sulphide.

Mosquitoes, House Flies, Stable Flies.—See under previous month.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

POULTRY.

As the first chickens should be hatched at the beginning of April, eggs should be set during the first week of March, and the breeding pens fully mated up at the beginning of February. The poultry keeper should, during January, go very carefully over his birds several times and select the strongest, best developed, most vigorous and the best layers of large eggs. These only should go into the breeding pens, and if possible run on free range for two or three weeks before going into them.

The male birds should be the acme of strength, vitality and health, and be sons of the best layers of large eggs.

The incubators should be thoroughly overhauled, disinfected and put into proper working order. The room in which they are to be operated should be cleaned out and disinfected; nothing else but incubators should be in the room, for as much fresh air as possible is necessary.

If broody hens are to be used for hatching it is as well to get them early, otherwise when the eggs are ready the hens to hatch them may be unprocurable. Always dip them and isolate them immediately they are obtained.

Many of the birds will be moulting; get them through it as quickly as possible. A pamphlet on the moult can be obtained from the Poultry Experts, Department of Agriculture.

Do not hatch any turkeys till the rains are over. Ducklings can be hatched all the year round, but the latter, as also the adult ducks, must have absolutely dry houses and sleeping quarters.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of half a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform plants for producing seed for next season's crop.

VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Territory, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	GAME LAW CONSOLIDATION ORDINANCE, 1906, AMENDING ACT, 1926.
17.12.26.	This Act prohibits the shooting of game during the time between half an hour after sunset and half an hour before sunrise. The restriction does not prohibit occupiers of land from shooting game which may be destroying their crops during the time mentioned. (G.N. 17.)
	NOXIOUS WEED ACT, 1926.
17.12.26.	This Act will come into operation on a date to be fixed by the Governor-in-Council by proclamation in the "Gazette." The following are included in the schedule of noxious weeds: Burweed, Xanthium spinosum; Mexican poppy, Argemone mexicana; Dodder, Cuscuta spp. (all species); Prickly pear, Opuntia tuna, Opuntia ficus-indica, Opuntia monacantha.

PIGS FOR SALE.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs. Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 407. Wheat.
No. 416. Grasses of Agricultural Importance in Southern Rhodesia, by H. G. Mundy, F.L.S., G. N. Blackshaw, O.B.E., B.Sc., F.I.C., and E. V. Flack.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring..
No. 423. The Common Sunflower, by C. Mainwaring.
No. 428. The Sweet Potato, by J. A. T. Walters, B.A.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters.
No. 462. Hay-making in Rhodesia, by C. Mainwaring.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 467. Soil Treatment and Manuring for Maize Production, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist.
No. 504. Castor Oil, by Guy A. Taylor, M.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.

No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 552. Mixed Farming in Matabeleland, by Gordon Cooper.
No. 557. Selection of Virgin Land for Arable Farming, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 560. Climatic Conditions and Cotton Growing in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 571. A Farmers' Calendar of Crop Sowings, by C. Mainwaring.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
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No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

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STATISTICS.

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No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 496. Statistics of Live Stock and Animal Products for the Year 1923, by A. Borradaile Bell.
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No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
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LIVE STOCK.

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No. 476. Tsetse Fly—Inspection of Shangani Experimental Area, by Rupert W. Jack, F.E.S.
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No. 516. The Coming Campaign against Locusts, by Rupert W. Jack, F.E.S.
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No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.

No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.

No. 283. Maize Foods for the Home.

No. 358. Notes on the Regulations Governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.

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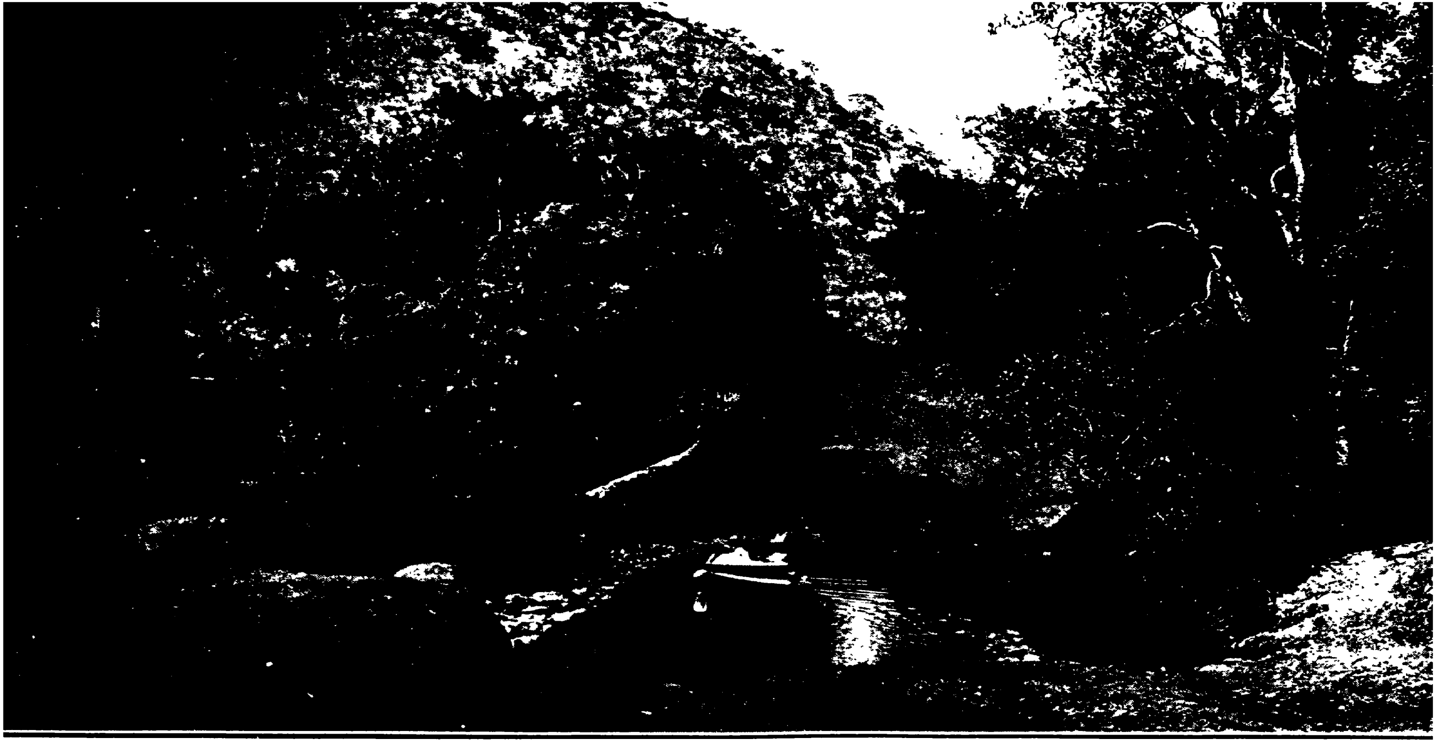

The Mazoe drift, below the dam.

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.

Specimens of Insect Pests.—The Chief Entomologist has asked us to draw attention to the fact that, not infrequently, specimens of insect pests are received without any definite indication of the sender's name and address. When a number of packages arrive by the same post this is liable to lead to confusion, as it is not always possible to identify the insects from information contained in the covering letter.

Those desiring advice or information concerning insects are therefore requested to make a point of writing their names on the outside of the immediate container of the specimens or of inserting a slip bearing this information.

Cold Storage Works at Bulawayo.—Farmers and stock owners are naturally anxious to know when the meat works at Bulawayo, in course of erection by the Imperial Cold Storage and Supply Co., Ltd., will be finished. We can assure them that every effort is being made to get the works completed, and that the company is just as anxious as are the pastoralist and the public generally to see the works actively functioning. As is known, a new company has been registered—the Rhodesia Export and Cold Storage Co., Ltd.—and work was commenced some months ago on the erection of the necessary buildings in the vicinity of Bulawayo. All further progress, however, has been held up pending delivery from England of steel girders ordered for the works. That these have not been forthcoming is due to the abnormal situation which has arisen in the iron and steel trade in Great Britain and the Continent in consequence of the coal strike. Everything possible has been done to accelerate delivery of the girders, without avail. The latest information is that shipment could not be effected from England until the 24th December at the earliest, and we can only hope that this equipment will arrive shortly and permit of building operations being continued with all possible despatch.

Irrigation in New Zealand.—The following extract from a letter, dated 8th November, 1926, received from Mr. C. P. Robinson, late Assistant Irrigation Engineer, Southern Rhodesia, and now with the Public Works Department, New Zealand, will be of interest to irrigationists in this Colony: "Owing to careful planning and only undertaking comparatively small schemes to start with, irrigation has been a great financial success in New Zealand. On none of the schemes so far constructed has there been any difficulty in collecting the rates.

"As I think I wrote on a previous occasion, practically all the works are owned and controlled by Government, the principle adopted being that the schemes, in addition to paying all maintenance charges, must pay interest on capital and a 1 per cent. renewal fund on all perishable parts, such as syphons, etc. The schemes are regarded as permanent assets and no repayment of capital is required. The rates

work out at from 12s. 6d. to 20s. per acre per annum on the various undertakings. The full rates are not levied during the first five years, but are on a sliding scale until the full amount is payable. Before a scheme is commenced a sufficient number of settlers have to sign agreements to take water at a specific rate for twenty-six years, after which period the rates are revised. The increased productiveness of the land is shown by the fact that whereas in Otago ordinary pasturage carried one sheep to four acres, the irrigated lands carry ten sheep per acre. Much of the so-called Canterbury lamb comes from Otago."

Crop Statistics.—We publish elsewhere in this issue of the Journal statistics of the summer crops grown by European farmers in Southern Rhodesia during the season 1925-26. The total area under crops, allowing for an estimate of 23,000 acres in respect of returns not received, was 355,481 acres, an increase of rather more than 20,000 acres over the acreage of the previous year. Of this total, 239,662 acres were planted with maize, which yielded 1,393,654 bags or 5.81 bags per acre. The crop was the second heaviest on record, that of the season 1922-23 amounting to 1,505,580 bags, while the average yield per acre that year was 6.81 bags. The Mazoe district produced 41.9 per cent. of the crop, the yield per acre being 7.7 bags. The Salisbury district produced 224,335 bags, averaging 6.4 bags per acre; and the Lomagundi district 164,387 bags, averaging 6.7 bags per acre. An analysis of farmers on the basis of crops grown shows that 259 grew maize only, while 1,597 grew maize and other crops.

The cotton crop yielded 8,974,898 lbs. of seed cotton from 66,086 acres, producing 2,721,188 lbs. of lint, or about 5,442 bales. The principal cotton growing districts were Mazoe with 21,585 acres, Hartley with 12,144 acres, and Lomagundi with 7,511 acres, and the yields were 2,592,800 lbs., 1,706,126 lbs. and 1,409,893 lbs. respectively. The returns are better than those of the previous year, but they show very clearly the extent to which cotton was affected by the excessive rains.

A record crop of tobacco was harvested, amounting to 5,313,186 lbs. of Virginia and 346,623 lbs. of Turkish. The area planted with Virginia tobacco, viz., 13,160 acres, was nearly double that of the previous year, but the acreage under Turkish tobacco shows a decrease of 136 acres. The number of tobacco growers, exclusive of those who omitted to render returns, was 336, an increase of 91 per cent. over the previous year's total.

The total number of returns dealt with was 2,621, but this total does not include farmers who took up land too late in the season to put in any crops, nor does it include farms temporarily unoccupied or those known to have no land under cultivation.

For the first time particulars are given this year of orchards other than citrus, and the returns show the total number of trees to be 124,208, of which total 84,478 are deciduous, including 24,206 apples, 36,447 peaches and 10,032 plums. There are 39,730 trees which come under the heading of tropical, including 4,580 mangoes and 14,270 paw paws.

Milk Recording.—Attention has been called in these columns on various occasions to the advantages to be derived from milk recording, and although progress has been made in this respect, farmers do not seem to realise how important it is that the milk from the various cows should be weighed and tested periodically in order that a true record can be kept and in order that it can be ascertained which are the best and the poorest producers. There is evidence that Rhodesian-bred dairy bulls are coming into favour, and in every case where dairying is aimed at, an enhanced price is obtained for bulls bred from cows whose milk production has been recorded and certified. In order to encourage the keeping of these milk records, the Government has had printed daily weighing record books of a capacity to contain a full record for 360 days of each of five cows. The system of daily weighing has been introduced in every progressive dairying country in the world, and although the system constitutes a certain tie on the farmer, it is of much greater value than periodical weighings, such as one day in the

week or one day in the month. In the event of the farmer being absent from the milking, a native can usually be trained to register the amount of milk produced per cow, and it is noteworthy how interested native milkers become in the production of the various cows which they milk. Such a system ensures the milking-out of the cow and is a check upon slovenly and inefficient milking; and in the event of any shortage it calls attention to the fact that the cow is possibly sick and requires attention. It is therefore to be hoped that more farmers will participate in the scheme, as it is certainly one which every progressive dairyman should take up and adhere to.

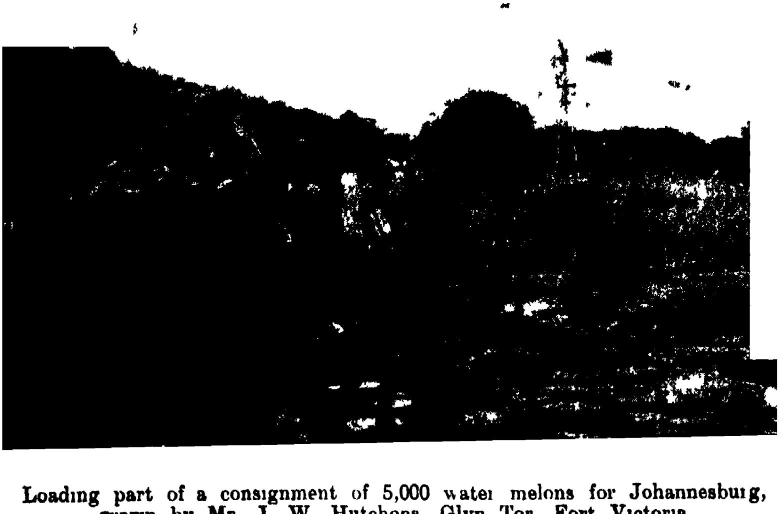
There is only one method by which the standard of milk production in this Colony can be raised, and that is by breeding from milk-recorded stock and feeding and treating this stock in a suitable manner. At present our average production is abnormally low, and many of our farmers milk 60 cows or more in order to get 30 gallons of milk. With suitable cows, well fed and well treated, this quantity of milk might well be obtained from a sixth of the number.

As an instance of what can be achieved in Rhodesia by careful feeding and milk recording, the performance of "De Grendel Sophie," the property of Mrs. G. M. Cowen, Lomond Farm, Salisbury, deserves notice. This cow, in a lactation of 300 days, has given 13,860 lbs. of milk, or an average of almost 4½ gallons per day over the 300-day period. This cow is due to calve in February, and is such a persistent milker that it is difficult to dry her off before she calves again.

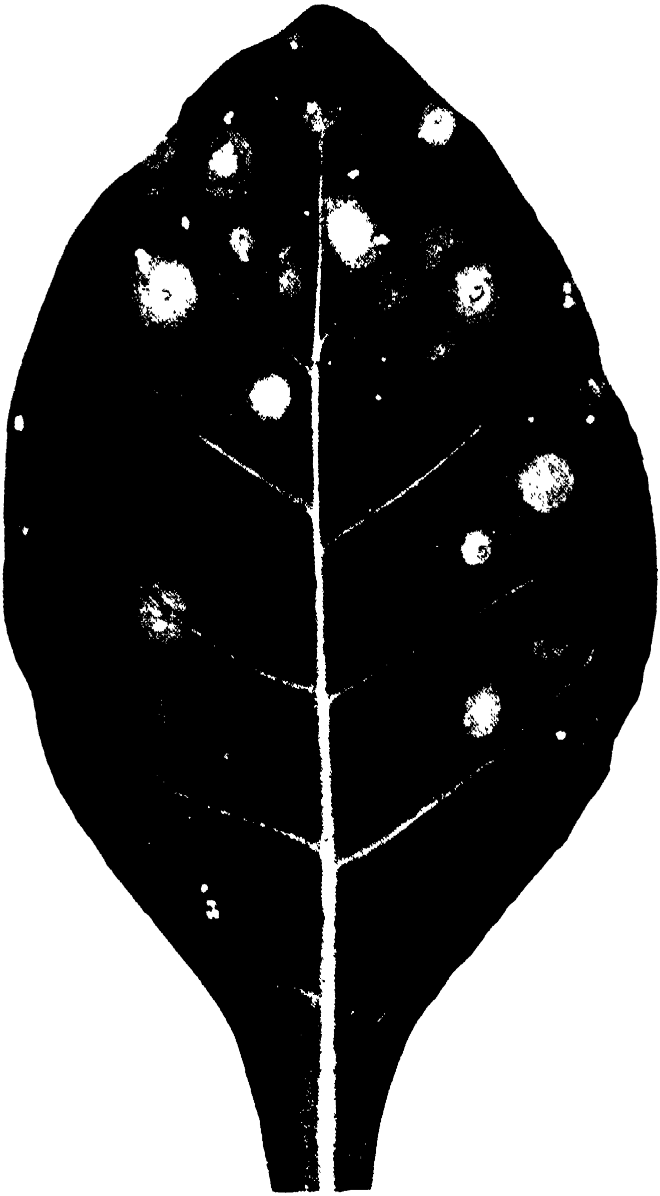
We have quite a number of cows in Rhodesia which have either exceeded or approached the 1,000-gallon mark, and it is to be hoped that the old tradition that good dairy cows will not thrive in Rhodesia, because of altitude, climatic peculiarities, etc., has been dissipated for ever. Milk recording has done its part in this achievement, and it is anticipated that the milk recording scheme will now be taken up with new zest by dairy farmers throughout the Colony.

The Influence of Dipping upon Trypanosomiasis.—We are taking the somewhat unusual course of publishing in

detail a series of experiments undertaken by the Director of Veterinary Research for the purpose of ascertaining the effect of dipping in solutions of arsenic upon the course of trypanosomiasis. This report at first sight would appear to be of purely theoretical interest, but on closer examination it will be found to have a bearing upon matters of very considerable practical importance. The details given indicate the very exhaustive and careful work which has been carried out in connection with this investigation, and the results, although by no means final, open up the prospect of a practical method of dealing with what is one of the most serious diseases of cattle, not only in this Colony, but in other parts of Africa.

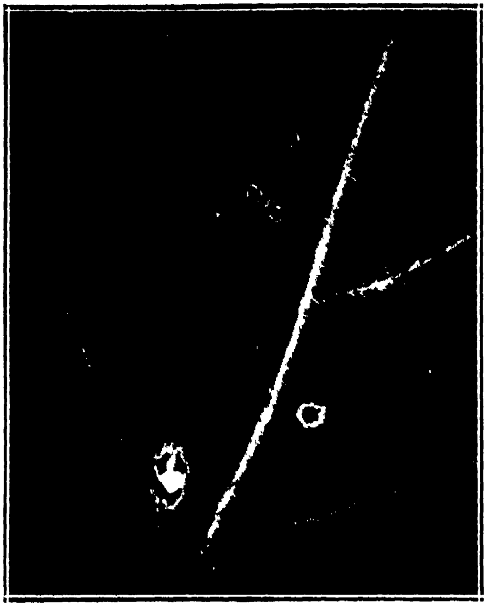


Loading part of a consignment of 5,000 water melons for Johannesburg, grown by Mr. J. W. Hutchons, Glyn Tor, Fort Victoria.



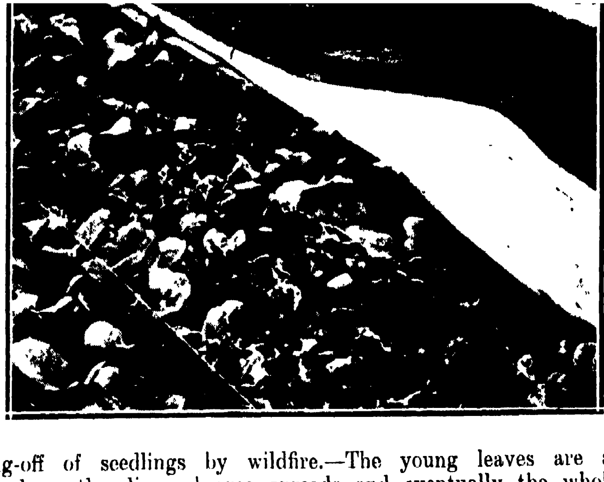
Young spots of tobacco wildfire. The spots made by the wildfire organisms have dark centres and a lighter halo. The spots with white centres and with a halo around them represent infections initiated by flea-beetles. The white spots without halos are holes made by the feeding of the flea-beetles, with no resultant infections. These spots are on plant-bed leaves about three days after inoculation.

(Bulletin of North Carolina Department of Agriculture.)



Blackfire spots on a seedling leaf of tobacco, as seen in transmitted light. The spots are angular and are bordered by a clear, narrow zone.

(Technical Bulletin 25, Virginia Agricultural Experiment Station.)



Damping-off of seedlings by wildfire.—The young leaves are attacked at the edges, the diseased area spreads and eventually the whole plant dries up. In very young seedlings the halo is either absent or else very indistinct, the disease taking the form of "firing."

On the Nature of Bacterial Diseases of Tobacco.

By J. C. F. Hopkins, B.Sc., A.I.C.T.A. (Trinidad),
Government Mycologist.

To those who are not familiar with the physiology of plants there is often a certain amount of confusion with regard to the nature of diseases, more especially those in which bacteria are concerned. The lay mind appreciates the danger of the presence of the typhoid bacillus in the human system, and there are few farmers who would care to harbour the organism in quantity on their estates, yet it is surprising how few realise that two of the most serious diseases of tobacco, "Wildfire" and "Blackfire" (angular spot), are caused by organisms of a similar nature to this.

Wildfire and angular spot are due to living germs which feed upon the tissues of the plant, causing death or disintegration of the cells in infected areas, which later become dried, producing the typical symptoms of the two diseases. The bacteria are equipped with long, whip-like appendages, by means of which they are capable of swimming about in a thin film of water on the leaf surface, and, as far as is known, original infection is brought about by the organisms entering the plant through a stoma or pore in the epidermis of the leaf. Once inside, they propel themselves in the tissue fluids and are usually carried along the veins in the sap stream from one part of the leaf to another, so that it is usual to find diseased areas starting from a vein. The bacteria attack the cells of the leaf and feed upon their contents, causing a breakdown of the tissues in this area. The dead tissue dries out from the centre and the area increases, following the advance of the germs, until a considerable portion of the leaf is involved. The spots often run together to produce a large dead patch, which later

becomes lacerated by the action of the wind, and the whole leaf may be torn to shreds and rendered useless.

The very early stages of the diseases are often difficult to detect, but it is certain that in the majority of cases the bacteria have originally obtained access to the tobacco seedlings in the seed beds. Mere unfavourable climatic conditions or over-watering cannot produce the diseases; the organisms must be present. Cold, wet weather favours the spread of the diseases, inasmuch as bacteria ooze through the leaf pores, swim about in the liquid on the leaf surface, and can easily be spread from one plant to another by driving rain, but the driving rain itself, though capable of causing mechanical damage, cannot cause wildfire or angular spot.

It is often thought that the sun is responsible for outbreaks of these two diseases, and the reason for this belief is not far to seek.

Although wet weather is favourable for dissemination of the bacteria, yet it is not necessarily ideal for their growth and multiplication in the plant. On the contrary, weather which is good for plant growth is also favourable for the development of the germs, so that bright sunshine after rain increases their activity, and in a short time symptoms of the disease become manifest. Imagine a few microscopic germs entering a leaf—probably so few that they would not be recognisable under a microscope. They feed upon the leaf tissues and multiply, but it is not until their numbers have increased sufficiently to infect and kill an area visible to the naked eye that the disease becomes noticeable to the observer. This period of time, known as the incubation period, is usually about four or five days, but varies with environmental conditions. It is most important that this phenomenon should be fully understood, since it is possible for one plant showing spots to be surrounded by apparently healthy plants which are in reality already infected and a source of infection to neighbouring individuals. Especially does this apply to seed beds, and all farmers should learn to recognise the first signs of infection, so that unhealthy plants and those surrounding them can be immediately removed to prevent spread of disease further.

It is not the object of the writer to reiterate once again measures for the control of diseases in seed beds. This

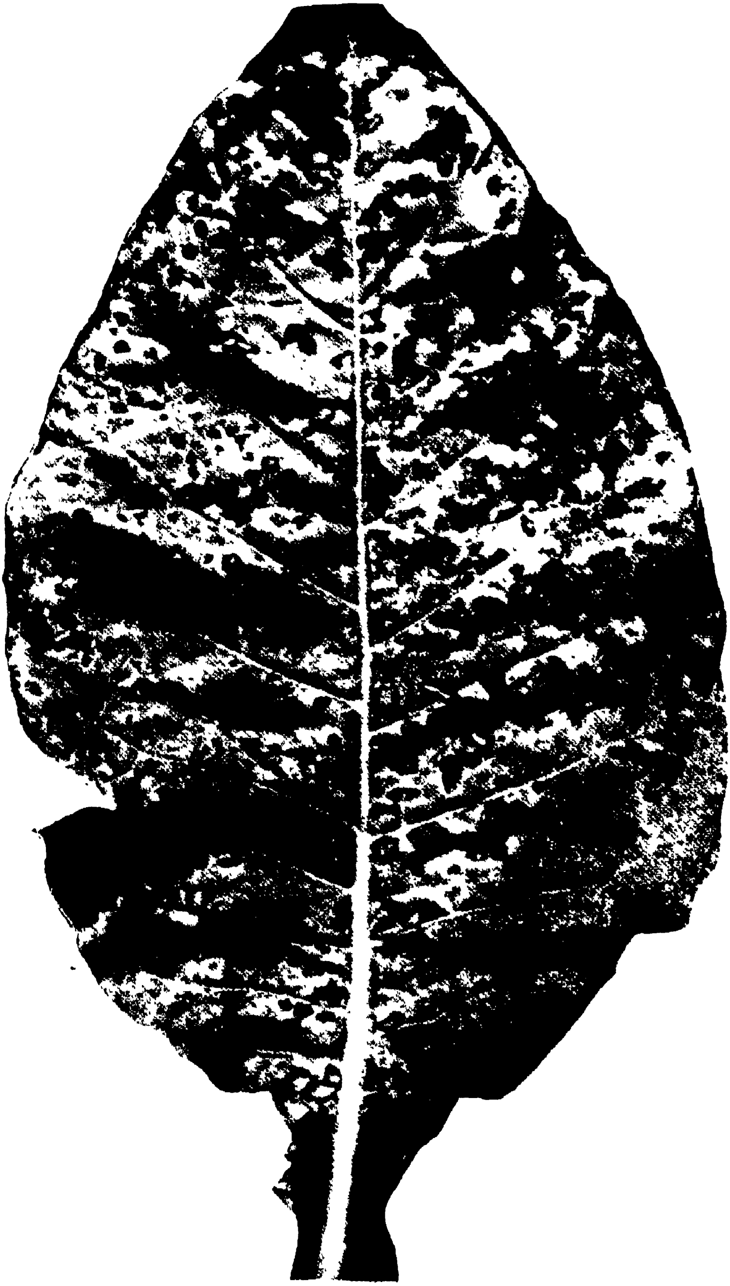
article endeavours to illustrate the life history of bacteria and to show that infection and spread of disease are no longer profound mysteries, but merely the logical results of a sequence of events. It will be well, however, to deal with the generally accepted control methods and to show exactly what effect these have upon plant pathogens.

The first important step in the prevention of tobacco diseases that is performed by the farmer is the burning of seed beds. It is not necessary to discuss here whether this process is beneficial or otherwise; it is merely necessary to understand the facts of the case. In almost every soil in the world there live certain well known fungi or bacteria which are capable of causing plant disease. In most cases the richest soil contains the greatest proportion of these organisms. It is certain that the soils of the large majority of sites chosen for seed beds have a network of fungal threads ramifying through their entirety. Now the majority of these organisms will not as a rule attack tobacco plants unless there is some condition present unfavourable to the growth of the latter, but as soon as this condition is brought about, particularly by over-watering, the very young seedlings are attacked and killed, and the result is damping-off. In the same way that angular spot is not caused directly by excessive sunshine, so in nearly all cases damping-off is not brought about solely by the presence of an excess of moisture. One or more organisms are concerned with the disease, and it is to kill off these organisms that the farmer burns his seed beds. What may probably be the most serious of all damping-off organisms is a bacterium which can live in the soil and which is capable of completely destroying every plant in a seed bed. It is the same organism that causes Granville wilt in the field, and is known as *Bacterium solanacearum*, because it attacks many genera of the *Solanaceæ* or potato family, to which tobacco belongs. This bacterium invades the roots of tobacco plants and passes in the sap stream up the conducting system, which it attacks and fills, preventing the further flow of sap and producing a wilt. If seedlings are not attacked early they may be planted out in the lands without having shown any symptoms of the disease, but in about two to four weeks the leaves begin to droop and a complete wilt sets in. At the same time the soil becomes infected by the bacterium

from the plant tissues, and, under repeated cropping, practically complete failure results. The organism may overwinter in the soil and in decaying refuse from previous crops for four or five years, and can be transferred from one field to another in soil attached to labourers' feet or on farm implements. It can thus be transferred to new seed-bed sites. It was mentioned above that *Bacterium solanacearum* attacks plants of the potato family other than tobacco, and this organism often maintains itself in apparently uninfected soil by feeding on solanaceous weeds which may not come under the farmer's notice. It has been shown that burning or steam sterilisation of the seed beds will kill any of these bacteria which may be present in the soil, but it is obvious that the heat from the fire must penetrate to a depth sufficient to include all the pathogens, since any living organisms remaining after burning will soon spread through and re-infect the soil. Seed bed sterilisation must be done thoroughly if the labour is not to be expended in vain, and as wheeled boilers are becoming more common in this country, it is possible that farmers in the near future may try the experiment of sterilising by the more efficient and up-to-date method of steaming.

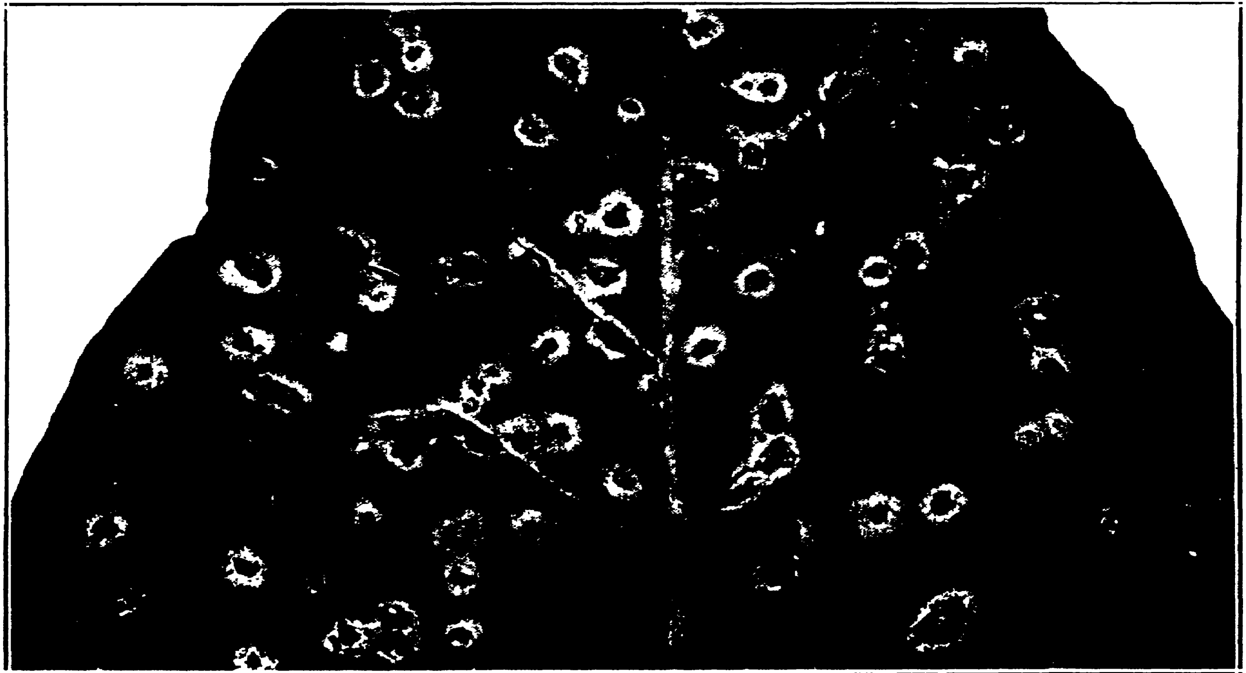
Having removed disease-producing organisms from his seed beds, the farmer is next required to ensure that his seed is not infected. As far as is known, the organisms of the two bacterial diseases wildfire and blackfire are carried on the outside of the seed, either in dust or else lodged in the minute crevices of the seed coat. Quite obviously the best method of removing infection from this source is by a contact poison, and excellent results have been obtained from the corrosive sublimate treatment; the poison enters through the wall of the bacterium, coagulates the living protoplasm and causes death.

These two operations have by no means removed all sources of infection. The farmer cannot be too careful, in every operation he performs, to make sure that every part of the material being used has not been in contact with a source of infection. Bacteria are capable of living from one crop to another on a large variety of media. Wildfire has been reported from numerous other plants of the *Solanaceæ*, and may survive on weeds growing on the farm. Old



Wildfire spots about five days old.

(Bulletin of North Carolina Department of Agriculture.)



Wildfire spots in medium-early stage of development. The halo is conspicuous at this stage. (Technical Bulletin 25, Virginia Agricultural Experiment Station.)

tobacco plants are a constant source of infection, whilst the microbes can live for many months after curing in tobacco which may be left in the barns or grading sheds. It is a common occurrence for cheese cloth and farm implements to be stored in a shed in which there are old tobacco leaves. This again presents an excellent source of infection for seed beds, since the bacteria are capable of remaining in a dormant state for a considerable period of time under unfavourable conditions, only to grow and multiply as rapidly as ever when placed in a favourable environment, such as a well-watered seed bed.

Now that a general idea has been obtained of the processes of infection, growth in the plant and dissemination of the two important leaf disease-producing bacteria of tobacco, it should be clearly discernible that once a leaf is infected there is nothing to be gained by using the usual fungicides. Once bacteria have established themselves in the leaf tissues, any poison that might be effective in killing the germs would also kill that part of the plant with which it came in contact. For this reason, every effort must be made to eliminate angular spot and wildfire from the seed beds, so that perfectly clean seedlings can be transplanted into the lands. The majority of farmers are perfectly aware of this fact, but a large number do not realise the many sources from which infection may arise and how simply these diseases may be spread by human and natural agencies. There are some who are averse to spraying their seed beds with a fungicide, but a consideration of the process of infection should make it clear that the presence of a contact poison on the surface of the leaf renders it impossible for bacteria to remain alive in such an environment, since it is known that Bordeaux mixture will kill these organisms. There may be exceptional cases in which the spray is washed off the leaves very soon after application, and a period of time may elapse before the next spraying sufficient to allow of infection taking place; this is especially likely in prolonged wet weather, but in the great majority of cases the intelligent use of fungicides is a very necessary precaution against infestation by leaf disease organisms generally.

The problem of control of bacterial leaf spots in the lands has so far remained unsolved, but a very good check may be kept on infected plants in normal weather by

watching carefully for the first symptoms of disease and removing immediately and destroying any leaves so affected. It is unwise to wait until a leaf has become thoroughly diseased before removing it, because infection of surrounding plants has probably been taking place since the first symptoms appeared. Prompt removal of all infected material and a spell of good growing weather should in most cases allow plants to grow ahead of the disease and so yield a good crop.

It is hoped that this explanation of the nature of bacterial diseases will assist in establishing on all farms an organised system of disease prevention.

Smithfield Prices.

The following prices prevailing at London Central Markets on the 30th December have been handed to us by Messrs. Hart, Harrison & Co.:—

Beef: Fresh killed and chilled, business quiet; frozen, small supplies, trade slow. Frozen pork: Trade slow, firmer tendency.

English long sides, 6½d. to 7½d. per lb.
Canadian long sides, 6½d. to 7½d. per lb.
Argentine chilled hinds, 5d. to 6¼d per lb.
Argentine chilled fores, 3¼d. to 3¾d. per lb.
Australian frozen hinds, 4d. to 4¼d. per lb.
Australian frozen crops, 3½d. to 3¾d. per lb.
New Zealand frozen pork, 9½d. to 10½d. per lb.
South African frozen pork, 6d. to 7½d. per lb.

Statistics of Summer Crops grown by Europeans

IN SOUTHERN RHODESIA FOR THE SEASON 1925-26.

By A. Borradaile Bell, Statistician.

During the season 1925-26 agriculture in the Colony may be considered to have made steady progress, and yields, if not as large as anticipated early in the season, were quite average and considerably better than those obtained during the previous season. Late rains are always detrimental, and the heavy rains which occurred in March and April are largely responsible for the yield, especially of maize, being below the estimate. Considering the conditions which prevailed subsequent to the framing of the estimate, the shortage of roughly 150,000 bags cannot be considered as a serious miscalculation. The two outstanding features in the season under review are the increase of the acreage planted to Virginian tobacco, which has been very nearly doubled, and the increase in the acreage planted to leguminous crops, especially velvet beans and cowpeas, both as crops for hay or seed as well as for green manure. The increase in tobacco is due to the payable nature of the crop itself, but the increase in leguminous crops points mainly to the adoption of more scientific methods of agriculture with a view to producing higher yields per acre. Cotton gave a considerably higher yield per acre than in 1924-25, but the return is still very much below what may be expected when weather conditions are more favourable and a type of cotton suitable to local conditions has been bred. Largely owing to the low price of raw cotton at present prevailing, the acreage under this crop will be considerably reduced during the current season, but maize planted on the old cotton fields is expected to give good results.

From a statistical point of view serious attention must be directed to the growing difficulty in obtaining returns from farmers. The Department is very loth to take legal action as provided for under the Ordinance, but unless those farmers who consistently neglect to furnish the necessary returns realise their obligations, steps will have to be taken to have the law enforced. Nearly three-quarters of the total number of returns were received by the end of October, and yet when the schedules were finally closed off in December there were still over 200 returns or 8 per cent. outstanding. With so large a number outstanding, representing at an estimate 23,000 acres, it became necessary to append to the schedules an estimate of at any rate the three principal crops. Owing to there being no individual details of the amounts estimated as outstanding in respect of maize, cotton and tobacco, the percentage and other data in connection with these crops have had to be worked out on the basis of the actual returns received.

ANALYSIS OF FARMERS ON THE BASIS OF CROPS GROWN.

District	Maize and other crops	Maize only	Other single crops	Mixed crops without maize	No crops	Out-standing	Total
Wankie	13	2	...	2	3	3	23
Nyamandhlovu	24	9	1	...	7	7	48
Bulalima-Mangwe	63	19	1	7	22	13	125
Matobo	31	11	...	1	16	2	61
Umzingwane ...	20	8	2	3	13	4	50
Bulawayo ...	39	5	6	5	17	10	82
Bubi	52	8	1	3	16	9	89
Sebungwe ...	1	1	...	...	1	...	3
Gwelo	172	30	2	3	39	21	267
Selukwe	30	2	...	3	8	2	45
Insiza	51	23	2	1	14	3	94
Gwanda	10	3	...	1	16	4	34
Belingwe	7	6	1	2	10	2	28
Victoria	61	22	...	...	15	2	100
Chilimanzi ...	32	10	1	1	9	1	54
Hartley	163	12	15	13	30	25	258
Lomagundi ...	123	15	5	10	20	10	183
Mazoe	190	13	12	6	12	20	253
Salisbury	165	6	2	7	21	18	219
Marandellas ...	48	3	7	6	13	9	86
Charter	53	12	2	2	19	6	94
Gutu	26	2	...	1	7	3	39
Ndanga	10	7	1	1	2	...	21
Chibi	5	...	1	...	1	...	7
Bikita	1	...	1	1	2	...	5
Melsetter	54	14	1	1	9	4	83
Umtali	54	8	2	2	18	11	95
Makoni	64	5	5	11	17	14	116
Inyanga	12	2	2	1	5	...	22
Mrewa	15	1	1	2	4	2	25
Mtoko	2	...	1	...	...	...	3
Darwin	6	...	...	1	1	1	9
	1,597	259	75	97	387	206	2,621

The total number of returns dealt with was 2,621, but this total does not include farmers who took up land too

late in the season to put in any crops, nor does it include farms temporarily unoccupied or those known to have no land under cultivation and only using the farm for grazing.

The thanks of the Department are due to the Police for assistance in the collection of returns as well as for information as to changes of ownership.

From the attached schedule it will be seen that 70 per cent. of the farmers in the country grow maize either as a single crop or in conjunction with other crops; 6.5 per cent. grow only one crop, in most instances maize; while 14.8 per cent. of the returns received show no crops of any kind.

The total area under summer crops, allowing for an estimate of 23,000 acres in respect of returns not received, is 355,481 acres, an increase of rather more than 20,000 acres. Of this total, 239,662 acres were planted to maize (grain) and 6,810 to maize for silage, 66,086 acres were planted to cotton, 13,915 acres to tobacco, 7,039 acres to green manure crops, 6,175 acres to ground nuts.

The percentage of acreages under the principal summer crops are given hereunder as compared with previous years:—

Crop	1925-26	1924-25	1923-24
Maize (grain)	67.2	69.6	80.8
Cotton	18.3	18.5	1.4
Tobacco	3.9	2.6	2.8
Green manure crops	2.1	(included with velvet beans, etc.)	
Maize (silage)	2.0	2.1	3.9
Ground nuts	1.9	1.5	2.1
Velvet beans, cowpeas and dolichos beans	.9	.8	1.7
Sunflower	.7	1.2	2.2
Beans	.6	.7	1.2
Potatoes	.5	.8	.8
Pumpkins	.4	.4	.4
Other crops	1.5	1.8	2.7
	100.0	100.0	100.0

The total acreage shown under irrigation is 8,493 acres (crops 5,944, and orchards 2,549). This is a total increase of 1,107 acres, but, as previously pointed out, a large proportion of this acreage is wet vleis and not really irrigation.

Maize.—The maize harvest from returns received was 1,308,654 bags, and a conservative estimate of outstanding returns accounts for a further 85,000 bags, making the total harvest 1,393,654 bags.

PRODUCTION OF MAIZE FOR TEN YEARS—
1916-17 TO 1925-26.

Season	Acres	Bags	Yield per acre
1916-17	203,150	938,130	4.62
1917-18	192,148	591,722	3.08
1918-19	173,313	889,969	5.13
1919-20	173,467	1,120,548	6.45
1920-21	186,246	1,220,768	6.55
1921-22	181,729	662,636	3.64
1922-23	220,937	1,505,580	6.81
1923-24	231,638	1,080,084	4.66
1924-25	232,947	1,041,904	4.47
Estimate	6,085	27,000	
1925-26	223,562	1,308,654	5.81
Estimate	16,100	85,000	

The estimate of the maize crop for the season was 1,550,000 bags, and the shortage of about 150,000 bags is only partly accounted for by the small error of .3 bag per acre between the estimated yield for the country and that actually recorded for the season. The balance is accounted for by a shortage of 13,000 acres between the figures given by farmers as "planted or to be planted to maize" and that actually grown as shown on the returns. Considering the amount of data available for framing an estimate, and the fact that weather conditions subsequent to the publishing of the estimate cannot be taken into account, a forecast of the maize crop cannot be expected to be within a smaller margin of error.

The accounting for the distribution of the actual crop reaped is quite another matter. The only data at present available in this connection are:—

(a) Exports.

(b) Reservations by farmers for farm use.

Local consumption, which should account for the difference between the total harvest and the exports, and on

which there are insufficient data to frame an estimate, except as regards (b), is a very variable factor. It is governed largely by:—

(1) Reservation by growers for use on the farms.
(2) The number of natives employed in mining and commercial undertakings.
(3) The amount of maize reaped by natives.
(4) To a limited extent by the number of new settlers and farmers and ranchers not growing maize, who purchase their requirements direct from the growers.

No figures are yet available of the number of bags exported during the year, but as far as can be ascertained, this is in the neighbourhood of 450,000 bags. The amount reserved by growers for farm use is 287,496 bags, or, allowing for returns not received and those who have omitted to fill in this column in the return, it can be placed in round figures at 300,000 bags. This only accounts for 750,000 bags, leaving a further 650,000 bags to be accounted for. Of this total, probably a certain amount is held in reserve by dealers with a view to supplying a possible shortage in the Union of South Africa or for subsequent shipment overseas.

The acreage under maize is practically the same as it was in 1924-25, but with the reduction in the acreage of cotton which is anticipated during the current season, the area under maize is likely to be considerably increased in 1926-27.

The following five districts still supply the bulk of the maize crop:—

District	Acres	Total yield	Yield per acre	Percentage of total crop
Mazoe	71,183	548,154	7.7	41.9
Salisbury	34,983	224,335	6.4	17.1
Lomagundi ...	24,585	164,387	6.7	12.6
Hartley	17,456	80,988	4.6	6.2
Gwelo	18,310	70,685	3.8	5.4
	166,517	1,088,549	6.5	83.2

The two analyses of this crop which are appended are instructive, especially that in which farmers are grouped

according to the yield per acre. From Table V. it will be seen that 418 farmers or 22.5 per cent. of those growing maize had yields of seven bags and over per acre, and produced 57.4 per cent. of the total crop. While it may be safely presumed that these farmers made a profit on this crop, they include a large number who grew only small acreages, for on reference to Table IV. it will be noted that only 289 farmers or 15.5 per cent. of the maize growers grew over 200 acres each and had an average harvest of 3,000 bags. The number of bags produced by these growers was 869,702, or 66.4 per cent. of the total crop, and the average yield per acre was 6.8 bags.

In calculating the number of growers of maize who secure a profit from this crop, both acreage and yield have to be considered, as well as whether the crop is grown for export or solely for use on the farm. But on the whole the yield per acre is the more important, and therefore Table V. is the better one on which to base any calculations. In this table we find roughly three classes:—

(a) 418 farmers or 22.5 per cent. of the maize growers had an average of 195 acres each and an average yield per acre of over 9 bags. No individual in this category had a yield per acre of less than 7 bags.

(b) 776 farmers or 41.8 per cent. averaged 121 acres each, with an average acre yield of 5 bags. The lowest acre yield in this category was 3 bags.

(c) 662 farmers or 35.67 per cent. averaged 72 acres each, and the average yield was only approximately $1\frac{1}{2}$ bags per acre.

While the above can only be taken as a general average, still it is a fair indication of the position of maize growers in the country. Section (a) can be safely presumed to be growing maize profitably. In section (b) those growing maize for farm use are probably doing so profitably, but those in this section who grow more than is sufficient for their own requirements would be well advised to increase the productivity of their land by better methods of farming so as to bring themselves into section (a). In section (c) one can only presume that the majority must be losing money on this crop.

Crops other than Maize (Grain).—The total under this heading is 108,919 acres, or, allowing for the estimated outstanding returns, 115,219 acres, an increase of 13,562 or 13 per cent. The chief increases are in cotton, 3,228 acres; tobacco, 5,474 acres; ground nuts, 1,108 acres; velvet beans, cowpeas and dolichos beans show an increase of 235 acres, but to this total must be added the greater part of 7,039 acres, which consisted mainly of these three crops used as green manure, which were included last season under the acreage shown for each crop. Of the crops under this heading, 70 per cent. are grown in the four districts of Mazoe, Salisbury, Hartley and Lomagundi.

Cotton.—The total acreage planted to this crop, allowing for the estimated acreage of outstanding returns, was 66,086 acres and the yield 8,219,525 lbs. of seed cotton, or an average of 124 lbs. per acre, as compared with an average yield last season of 93 lbs. per acre. The above is obviously an under-statement of the crop reaped, possibly due to want of facilities for weighing on the farms, for the ginneries received 8,974,898 lbs. of seed cotton, producing 2,721,188 lbs. of lint, or about 5,442 bales.

The following are the principal districts in which this crop was grown, and together they had 84 per cent. of the acreage planted, and produced 88 per cent. of the crop:—

District	Acreage	Total yield, lbs. seed cotton	Yield per acre, lbs.
Mazoe	21,585	2,592,800	120
Hartley	12,144	1,706,126	140
Lomagundi	7,511	1,409,893	188
Gwelo	3,721	389,938	105
Salisbury	3,618	285,624	79
Selukwe	2,570	407,350	159
	51,149	6,791,731	133

A statement is attached, Table VI., which shows the growers of cotton analysed according to the yield per acre. This statement shows a better return per grower than last season, but it also shows that a very small percentage reaped even a moderate crop. Of the total growers of cotton, only 33 or 3.61 per cent. reaped over 400 lbs. per acre. The

acreage planted by this group was 1,543 acres, or 2.5 per cent. of the total acreage; while the crop reaped was 691,319 lbs. of seed cotton, or 9.0 per cent. of the total.

There were 524 farmers or 57.7 per cent. of all cotton growers who reaped under 100 lbs. of seed cotton per acre from 28,750 acres, or 47.3 per cent. of the total acreage planted. The very low yield during the last two seasons, together with the drop in the price of raw cotton, will undoubtedly have a very great influence on the acreage planted to cotton during the ensuing season.

Tobacco.—The total acreage planted to tobacco, allowing for an estimate of the outstanding returns, was 13,915 acres, of which 13,160 acres were planted with Virginian tobacco and 755 with the Turkish variety. The total crop of Virginian tobacco was 5,313,186 lbs., or 404 lbs. per acre; and Turkish, 346,623 lbs., or 459 lbs. per acre. The increase in acreage is entirely in that planted with the Virginian variety, as Turkish tobacco shows a decrease of 136 acres.

The yield per acre from Virginian tobacco shows a decided improvement on last year, having increased from 263 lbs. per acre to 404 lbs. per acre; but an examination of the individual yields obtained shows that a far higher average yield may be anticipated as growers become more fully acquainted with the cultural needs of this crop. The suitability of this crop to the climatic and other conditions of this Colony has now been fully demonstrated, and with the decline in popularity of cotton it is probable that the acreage planted to tobacco during 1926-27 will be second only to that planted to maize.

PRODUCTION OF TOBACCO, 1918-19 TO 1925-26.

	Virginian		Turkish	
Season	Acres	Yield	Acres	Yield
1918-19	3,198	1,179,932	999	287,680
1919-20	5,546	2,435,994	1,958	511,633
1920-21	7,888	3,192,662	1,643	554,320
1921-22	9,007	2,880,104	1,167	302,255
1922-23	7,758	2,540,942	1,296	269,839
1923-24	7,001	3,426,390	1,002	452,070
1924-25	7,550	1,987,382	891	418,522
1925-26	12,160	4,993,186	755	346,623
Estimated	1,000	320,000		

A statement is attached (Table VII.) which shows an analysis of tobacco growers (Virginian and Turkish) on the basis of the yield per acre obtained. From this statement it will be seen that the number of tobacco growers, exclusive of those who omitted to render returns, was 336, an increase of 91 per cent. Of this total, 139 or 41 per cent. had yields of over 400 lbs. per acre. The area cultivated by this group was 5,973 acres, or 46 per cent. of the total acreage, and the crop produced was 3,391,667, or 63 per cent. of the total harvest, and an average yield per acre of 568 lbs.

Though the number of growers who reaped nothing was relatively large, being 23, or 7 per cent., they were probably mostly farmers experimenting with small plots with a view to gaining experience before going to the expense involved in erecting the necessary barns. The total acreage represented by this group was only 85 acres, or .7 per cent. of the total acreage under tobacco, and an average of little more than 3½ acres per grower.

Maize (Silage).—The total acreage of maize planted for the purposes of silage was 6,810 acres; of this, the yield from a small number of acres was fed direct to stock and no record of tonnage kept. The balance yielded a return of about 3 tons to the acre. In addition to maize planted specifically for this purpose, a certain amount of silage is made from maize tops and from poor sections of the maize planted for grain which are not likely to yield any crop. The total weight of silage from this source is shown as 2,082 tons.

Ground Nuts.—The acreage planted with this crop has increased by 1,108 acres, being 6,175 acres as compared with a total of 5,067 acres in the previous season. The total crop was 52,058 bags, an average yield of 8.4 bags per acre—an increased yield of 2 bags per acre. Considering the yield per acre which is obtained by many growers, the average yield for the country is still a good deal below what might be expected, and indicates that greater attention should be paid to seed selection and the cultural requirements of this crop.

Sunflowers.—This crop has been rapidly declining in popularity during the last three years. In 1923-24 the acreage planted was 6,232 acres, in 1924-25 this was reduced

to 3,912 acres, while during the season under review only 2,319 acres were planted as a crop and 457 acres were planted and ploughed in as green manure. The yield per acre, on the other hand, shows a slight improvement from 3.2 bags in 1923-24 to 3.5 bags in 1924-25, and a further rise to 4.3 bags in 1925-26. A small proportion of the acreage grown is used for silage, or the crop is fed direct to stock and no record of the yield kept.

Potatoes.—The total acreage planted as a summer crop was 1,510 acres, a decrease of 895 acres or 37 per cent. on land allocated to this crop in 1924-25. The total harvest was 30,734 bags, or a yield of 20 bags per acre. The average yield during the previous season was 19 bags per acre. The bulk of the crop is grown in the Salisbury district, which from 534 acres, or 35 per cent. of the total acreage, reaped 17,837 bags or 58 per cent. of the total crop. The yield per acre for this district averaged 34 bags.

The very low percentage yield of potatoes may be explained by the fact that a large proportion of growers produce the crop merely in sufficient quantities to meet their own requirements on the farm, while even those who to some extent specialise in potato growing fail to give the crop the best treatment owing to the present limited and very uncertain local market.

Beans (Edible).—The total acreage planted was 2,290 acres, which is practically the same as the previous season. The average yield per acre was 1.5 bags, which is slightly better than the average of 1.1 bags for the previous season.

Velvet Beans.—Under this heading 1,329 acres were grown, of which 682 acres yielded 478 tons of hay and 627 acres yielded 634 bags of seed. In addition, under crops planted for green manure we find 3,244 acres of velvet beans, which brings the total to 4,553 acres. This, however, is not the total acreage, for under green manure crops, of which a detailed statement is given below, there are three headings: Beans, Unspecified and Mixed, totalling altogether 2,071 acres, of which the major proportion is undoubtedly velvet beans. The total acreage under this heading in 1924-25 was 1,944 acres, and in 1923-24, 4,122 acres; so that even this latter total has been considerably exceeded in the season under review.

Cowpeas and Dolichos Beans.—Mention might here be made of two similar crops, namely, cowpeas and dolichos beans, the planting of which has also increased very considerably.

In the season 1924-25 cowpeas and kaffir beans accounted for only 515 acres and dolichos beans for 102 acres. The totals for the current season, excluding any acreage planted to these crops and shown in the schedule below under the headings of Beans, Unspecified or Mixed Crops, were—cowpeas and kaffir beans 1,366 acres, and dolichos beans 968 acres.

This increased planting of leguminous crops is certainly one of the most satisfactory facts disclosed by the statistics for the season under review.

Green Manure Crops.—This was a new heading inserted in the schedule of crops this season, and although previously farmers supplied this information under the name of the particular crop or under "other crops," the present system is more satisfactory. A detailed statement is given below of the various crops grown for this purpose. Of the total of 7,039 acres, 2,834 acres or 40 per cent. are in the Mazoe district and 1,685 acres or 24 per cent. are in the Salisbury district.

SUMMARY OF CROPS PLANTED FOR GREEN MANURE.

Crop	Acres
Velvet beans	3,244
Beans	625
Cowpeas	468
Sunflowers	457
Dolichos beans	305
Sunn hemp	284
Cotton	105
Kaffir beans	94
Niger oil	6
Buckwheat	5
Various mixed crops	701
Crops unspecified	745
	7,039

Exotic Fodder Grasses.—The area under this heading appears to be decreasing, as only 1,257 acres are shown this

year, as against 1,877 acres in 1924-25 and 2,663 acres in 1923-24. It is possible, however, that farmers omit to include pasturage which has been planted for some years.

The following is the acreage under each variety:—

Variety	Acres 1924-25	Acres 1925-26
Teff	721	526
Sudan	313	127
Paspalum	287	206
Napier	259	301
Kikuyu	254	66
Other grasses	43	31
	1,877	1,257

Kikuyu has not proved a success except under irrigation or on very special soils. It is of interest to see that Napier fodder is increasing in acreage, and the merits of this grass are perhaps being better appreciated.

Other Crops.—The remaining crops require no special comment, as details will be found in the accompanying tables.

Orchards (Citrus).—The total number of citrus trees is 201,181, which for the second year in succession shows a small decrease, the number in 1924-25 being 203,591. The orchards on farms whose owners failed to render returns would probably account for the difference. Of this number, 150,877 are bearing and 50,304 not bearing, and 176,813 are oranges and 24,368 are other citrus fruits. From the returns received, 41,303 boxes were shown as sold or exported, and this presumably represents the export trade for the year, though official figures in this connection are not yet available. In addition, some 2,000,000 citrus fruit were sold, though this figure cannot be considered very reliable.

Other Orchards.—For the first time details were this year obtained of orchards other than citrus, and the returns show the total number of trees in the country to be 124,208; of this total, 84,478 are deciduous, including 24,206 apples, 36,447 peaches and 10,032 plums. There are 39,730 trees which came under the heading of tropical, including 4,580 mangoes, 14,270 paw paws; but this total also includes about 10,000 bananas, which, strictly speaking, should not have been included.

The figures relative to fruit sold are not sufficiently accurate to warrant publication, largely on account of the different ways they are marketed, such as by "numbers," or "lbs.," or in "sacks," "boxes," "trays," "petrol cases," etc. This makes it difficult to arrive at a reliable figure, either in weight or numbers. If no definite amount or value can be put on fruit marketed, there is still sufficient evidence to show that at any rate in some cases sale of fruit is a side-line which helps quite materially towards the general farm revenue. A point, however, which is particularly noticeable from an examination of the individual returns is that a considerable number of farmers who do not dispose of fruit have orchards far larger than necessary to supply the requirements of the farm, and such orchards must not only have meant a large capital outlay, but, if properly attended to, must be a source of no small expenditure on which no adequate return is being obtained, and instead of being an asset would more properly be placed in the category of a liability.

Forestry.—The area under forest trees is shown as 5,015 acres, an increase of 1,391 acres or 38 per cent., which indicates that an increasing amount of attention is being paid to this branch of agriculture. The following totals show a steady increase during the last three years:—1923-24, 2,547 acres; 1924-25, 3,624 acres; 1925-26, 5,015 acres. The total of 5,015 acres includes the following:—Eucalypts, 3,412 acres; cupressus, 233 acres; wattles, 218 acres; pines, 89 acres; toonas, 61 acres; and mixed plantations, 945 acres.

TABLE II.

ORCHARDS AND PLANTATIONS, 1925-26.

	Citrus orchards.						Other orchards.						Plantations of forest trees.		
	Total No. of trees.		Oranges.		Other citrus.		Total No. of trees.		Deciduous.		Tropical.		Eucalyptus.	Cupressus.	All other
	Irrigated.	Not irrigated.	Trees bearing.	Trees not bearing.	Trees bearing.	Trees not bearing.	Bearing.	Not bearing.	Trees bearing.	Trees. not bearing.	Trees bearing.	Trees not bearing.	Acres.	Acres.	Acres.
Wankie	588	116	185	368	76	75	246	10,026	54	55	192	9,971	...	...	...
Nyamandhlovu ...	308	472	228	65	430	57	86	220	47	147	39	73	3	...	...
Bulalima-Mangwe ...	863	809	646	293	589	144	827	693	735	538	92	155	3	1	6
Matobo	291	280	175	52	303	41	379	75	290	42	89	33	4	...	35
Umzingwane ...	1,861	1,253	2,090	146	737	141	2,021	561	1,601	382	420	179	6	1	6
Bulawayo	1,256	304	776	283	444	57	1,334	378	1,090	326	244	52	2	...	1
Bubi	1,059	335	662	420	209	103	519	1,495	372	1,250	147	245	42	...	3
Sebungwe	27	...	20	...	7	...	...	...	...	...	...	...	...	...	...
Gwelo	3,590	1,872	3,329	799	926	408	5,165	3,312	4,490	2,667	675	645	140	5	20
Selukwe	366	250	247	91	156	122	412	1,331	352	1,299	60	32	27	...	...
Insiza	801	454	339	331	422	163	771	756	593	681	178	75	9	...	4
Gwanda	366	572	515	180	167	76	184	209	146	182	38	27	...	...	...
Belingwe	96	674	52	594	42	82	263	318	211	297	52	21	...	...	...
Victoria	1,686	1,579	1,928	501	682	154	2,186	1,708	1,790	1,219	396	489	65	2	5
Chilimanzi	574	1,292	1,027	291	442	106	2,644	502	2,532	453	112	49	192	...	221
Hartley	9,255	3,973	8,902	1,619	1,616	1,091	4,112	2,771	2,000	1,101	2,112	1,670	118	3	2
Lomagundi	12,900	3,163	12,433	1,646	1,100	884	1,975	2,683	1,161	2,108	814	575	78	10	4
Mazoe	98,392	8,253	72,311	31,675	2,300	359	5,643	5,367	2,256	1,094	3,387	4,273	148	6	310
Salisbury	2,728	8,073	6,356	1,538	2,754	153	11,336	3,492	7,843	2,448	3,493	1,044	846	21	93
Marandellas ...	140	2,617	1,581	204	861	111	2,573	864	2,166	738	407	126	1,128	50	160
Charter	1,314	642	855	510	367	224	2,455	738	2,312	718	143	20	39	...	1
Gutu	152	603	374	136	148	97	947	392	866	317	81	75	65	1	5
Ndanga	12	360	201	56	85	30	422	144	380	103	42	41	1	...	...
Chibi	335	31	165	59	82	60	226	221	59	25	167	196	1	...	...
Bikita	60	3	41	...	17	5	225	150	223	...	2	150	...	...	...
Melsetter	5,136	757	3,584	644	1,351	314	8,497	1,648	6,164	1,244	2,333	404	64	6	262
Umtali	14,431	1,424	12,849	1,024	1,021	961	6,751	5,190	5,354	4,216	1,397	974	302	125	160
Makoni	299	1,451	732	286	488	244	4,382	2,890	4,180	2,446	202	444	75	2	14
Inyanga	232	...	80	32	102	18	4,304	4,249	4,210	4,203	94	46	6	...	48
Mrewa	10	299	128	111	63	7	306	260	295	235	11	25	38	...	...
Mtoko	...	15	10	...	5	...	90	55	40	55	50	...	10	...	...
Darwin	18	109	17	21	47	42	108	121	59	18	49	103	...	...	...
Totals ...	159,146	42,035	132,838	43,975	18,039	6,329	71,389	52,819	53,871	30,607	17,518	*22,212	3,472	233	1,370

* Includes 10,000 bananas.

TAB .

DISTRICTS IN ORDER OF SUMMER 'S OTHER THAN MAIZE (GRAIN).

District.	Total growers of other crops.	Total No. of farmers.	Total acreage.	Average No. of acres per grower.	Cotton, acres.	Tobacco acres.	ze ge), s.	Ground nuts, acres.	Sun-flower, acres.	Potatoes, acres.	Beans, acres.	Velvet beans, acres.	Exotic grasses, acres.	Pump-kins, grown separately, acres.	Other crops, acres.
Mazoe	208	253	31,232	150	21,585	2,400	19	1,780	426	66	518	188	146	38	3,366
Hartley	191	258	16,409	86	12,144	1,917	84	618	206	68	244	54	33	132	709
Salisbury	174	219	12,671	72	3,618	1,676	29	1,334	520	534	359	557	403	54	2,787
Lomagundi	138	183	12,392	90	7,511	1,962	82	803	136	77	225	152	25	127	892
Gwelo	177	267	6,176	35	3,721	178	171	223	204	181	94	49	45	280	530
Marandellas	61	86	4,487	73	618	2,666	139	251	57	58	89	10	186	68	345
Makoni	80	116	4,255	53	1,626	1,294	170	109	66	79	113	9	64	44	681
Selukwe	33	45	3,069	93	2,570	4	79	66	39	24	37	4	...	17	229
Bubi	56	89	2,129	38	968	...	522	44	136	25	13	36	35	44	256
Bulawayo	50	82	1,827	36	809	251	558	18	22	11	1	21	...	7	129
Umtali	58	95	1,596	27	468	4	227	91	35	47	247	29	70	28	350
Bulalima-Mangwe ...	71	125	1,347	19	462	...	378	45	76	26	31	4	7	51	267
Nyamandhlovu ...	25	48	1,144	46	466	85	90	108	89	3	10	38	7	13	235
Victoria	61	100	1,137	19	503	...	194	61	48	48	53	19	12	33	166
Insiza	54	94	1,096	20	149	3	455	42	59	93	23	8	38	91	135
Mrewa	18	25	1,061	60	600	233	12	103	29	7	44	...	...	5	28
Charter	57	94	868	15	207	17	212	46	27	48	57	...	4	50	200
Chilimanzi	34	54	742	22	171	41	88	8	27	28	25	43	53	24	234
Ndanga	12	21	663	55	518	4	...	15	1	5	...	...	...	...	120
Matobo	32	61	626	19	155	...	212	83	38	21	6	15	1	16	79
Melsetter	56	83	619	11	449	3	...	...	...	14	30	...	26	35	62
Umzingwane	25	50	614	24	108	...	201	47	39	22	1	4	12	62	118
Darwin	7	9	597	72	316	2	2	177	1	...	9	...	...	...	...
Gutu	27	39	446	16	126	150	28	12	4	3	9	2	3	11	98
Wankie	15	23	409	27	216	...	7	7	8	...	7	...	...	9	155
Gwanda	11	34	387	35	92	...	103	41	5	...	1	38	53	25	29
Chibi	6	7	326	54	232	...	33	19	...	1	...	18	...	...	23
Belingwe	10	28	254	25	81	...	50	20	17	3	3	31	3	23	23
Bikita	3	5	180	60	157	...	15	2	...	1	1	...	...	..	4
Inyanga	15	22	147	9	100	...	...	2	4	17	2	...	...	7	15
Mtoko	3	3	78	26	40	25	...	...	...	...	13	...	...	...	...
Sebungwe	1	3	25	25	...	...	...	...	...	...	25	...	...	...	...
Totals ...	1,769	2,621	108,919	61	60,786	12,915	6,810	6,175	2,319	1,510	2,290	1,329	1,226	1,294	12,265

TABLE IV.

MAIZE CROP, 1925-26.

Analysed in groups according to the number of acres of land planted to maize on each farm.

Calculated on $\frac{1856 \text{ maize growers}}{2621 \text{ farmers}} = \frac{70.81 \text{ growers.}}{100.00 \text{ farmers.}}$

Farmers grouped according to size of maize lands, in acres.	Maize growers.			Area under maize.			Crop.			
GROUP.	Number.	Per cent. of all farmers.	Per cent. of all growers.	Acres.	Per cent of area.	Average acres per farm.	Number of bags.	Per cent. of total crop.	Yield per acre, bags.	Average harvest per farm, bags.
A—301 and over ...	173	6.60	9.33	96,697	43.25	559	686,214	52.43	7.10	3,966
B—201 to 300 ...	116	4.43	6.25	30,877	13.81	266	183,488	14.02	5.94	1,581
(A & B) ...	289	11.03	15.58	127,574	57.06	441	869,702	66.45	6.82	3,009
C—101 to 200 ...	259	9.88	13.95	40,804	18.26	158	204,914	15.66	5.02	791
(A & B & C) ...	548	20.91	29.53	168,378	75.32	309	1,074,616	82.11	6.38	1,961
D—100 and under ...	1,308	49.90	70.47	55,184	24.68	42	234,038	17.89	4.24	179
(A & B & C & D) ...	1,856	70.81	100.00	223,562	100.00	120	1,308,654	100.00	5.85	705
E—None	765	29.19								
(A & B & C & D & E)	2,621	100.00								

TABLE V.

MAIZE CROP, 1925-26.

in groups according to the yield per acre.

Groups.	Number of maize growers.	Per cent. of growers.	Number of acres.	Per cent. of area.	Total crop (bags).	Per cent. of crop.
A—10 bags per acre and over ...	142	7.65	24,848	11.12	282,248	21.57
B—7 to 10 bags	276	14.87	56,816	25.41	469,751	35.90
	418	22.52	81,664	36.53	751,999	57.47
C—5 to 7 bags	362	19.50	54,411	24.33	324,579	24.80
D—3 to 5 bags	414	22.31	39,773	17.79	156,184	11.93
	1,194	64.33	175,848	78.65	1,232,762	94.20
E—1 to 3 bags	468	25.22	33,849	15.14	68,568	5.24
F—Under 1 bag	158	8.51	12,887	5.77	7,324	.56
	1,820	98.06	222,584	99.56	1,308,654	100.00
G—Nil	36	1.94	978	.44	...	...
	1,856	100.00	223,562	100.00	1,308,654	100.00

TABLE VI.

COTTON CROP, 1925-26.

Analysed in groups according to yield per acre.

Group.	Number of growers.	Per cent. of growers.	Number of acres.	Per cent. of acres.	Total crop (lbs. seed cotton).	Per cent. of crop.
A—651 lbs. to 700 lbs. and over ...	2	·22	5	·01	3,665	·05
B—601 ,, 650 lbs.	1	·11	10	·02	6,326	·09
C—551 ,, 600 ,, ...	4	·44	137	·23	80,200	1·04
D—501 ,, 550 ,, ...	3	·33	148	·24	76,900	1·00
E—451 ,, 500 ,, ...	14	1·54	651	1·07	310,968	4·05
F—401 ,, 450 ,, ...	9	·99	592	·97	213,260	2·78
G—351 ,, 400 ,, ...	16	1·76	1,163	1·92	448,965	5·85
H—301 ,, 350 ,, ...	17	1·87	612	1·01	201,748	2·63
I—251 ,, 300 ,, ...	44	4·85	3,507	5·77	930,033	12·12
J—201 ,, 250 ,, ...	70	7·71	5,473	9·01	1,218,838	15·88
K—151 ,, 200 ,, ...	91	10·02	9,095	14·96	1,635,158	21·31
L—101 ,, 150 ,, ...	113	12·45	10,643	17·51	1,345,037	17·52
M— 51 ,, 100 ,, ...	167	18 39	11,902	19·58	893,648	11·64
N— 1 ,, 50 ,, ...	185	20·38	12,088	19·87	309,779	4·04
Nil	172	18·94	4,760	7·83	...	...
	908	100.00	60,786	100.00	7,674,525	100.00

TABLE VII.

TOBACCO CROP, 1925-26.

Analysed in groups according to yield per acre.

Group.	Number of growers.	Per cent. of growers.	Number of acres.	Per cent. of area.	Total crop.	Per cent. of crop (lbs.).
Lbs. per acre.						
A—1,001 and over	5	1.49	43	.33	50,500	.94
B—901 to 1,000 lbs.	4	1.19	7	.05	6,850	.15
C—801 to 900 ,, ...	7	2.08	160	1.24	137,231	2.57
D—701 to 800 ,, ...	11	3.27	480	3.72	341,620	6.39
E—601 to 700 ,, ...	19	5.65	1,692	13.10	1,093,350	20.47
F—501 to 600 ,, ...	39	11.61	1,401	10.85	773,987	14.50
G—401 to 500 ,, ...	54	16.07	2,190	16.96	988,129	18.50
H—301 to 400 ,, ...	80	23.81	3,122	24.17	1,110,549	20.80
I—201 to 300 ,, ...	55	16.37	2,653	20.54	706,851	13.23
J—101 to 200 ,, ...	23	6.85	667	5.17	115,535	2.16
K— 1 to 100 ,, ...	16	4.76	415	3.21	15,207	.29
L— Nil	23	6.85	85	.66	...	...
Totals	336	100.00	12,915	100.00	5,339,809	100.00

Table VIII.

ACREAGE IN RELATION TO CLASS OF CROP, 1924-25 AND 1925-26.

Crop	Acreage 1925-26	Acreage 1924-25	Total acreage 1925-26	Total acreage 1924-25
Grain—				
Maize	239,662	239,032		
Kaffir corn	276	719		
Buckwheat ...	470	614		
Rapoko	114	142		
Rice	111	94		
Wheat (summer)	16	7		
Oats	30	36		
Millet	21	...		
			240,700	240,644
Succulent and Root Crops—				
Potatoes	1,510	2,405		
Pumpkins	1,294	1,338		
Sweet potatoes	660	672		
Cattle melons ...	576	297		
Mangolds	13	18		
Cassava	...	103		
			4,053	4,833
Legumes—				
Green manure crops	6,182	...		
Ground nuts ...	6,175	5,067		
Beans, edible ...	2,290	2,215		
Velvet beans ...	1,329	1,944		
Cowpeas	804	515		
Dolichos beans	663	102		
Peas	39	66		
Other beans ...	6	...		
			17,488	9,909
Fodders—				
Maize (silage)	6,810	7,049		
Exotic grasses	1,257	1,877		
Oats (forage) ...	256	183		
Millet	198	403		
Lucerne	150	175		
Barley (forage)	43	18		
Other fodders ...	6	74		
			8,720	9,779

Crop	Acreage 1925-26	Acreage 1924-25	Total acreage 1925-26	Total acreage 1924-25
Various—				
Cotton	66,086	62,858		
Tobacco	13,915	8,441		
Sunflower	2,319	3,912		
Green manure	857	...		
Sisal	300	...		
Sunn hemp ...	202	137		
Vegetables	89	61		
Sugar cane	60	...		
Broom corn ...	31	70		
Dhal	21	13		
Linseed	20	17		
Coffee	7	...		
Other crops ...	13	15		
			83,920	75,524
			354,881	340,689

The Growing of Potatoes in Southern Rhodesia.

(Revised.)

By C. Mainwaring, Agriculturist.

It is well to know something of the plant and its habits before studying its culture. The potato (Solanum tuberosum) is the most valuable of a very big family of plants. It is closely related to tobacco, tomato, chillies, and also to that troublesome weed, the wild Cape gooseberry. The potato is classed as an annual, but is virtually a perennial by means of its tubers. The flowers are borne in clusters, varying in colour from pure white to purple; the fruit or seed ball is a globular or short oval berry. It contains small, white, kidney-shaped seeds embedded in the midst of a green pulp. These seeds, if collected when ripe, can be sown for the purpose of raising new varieties. The tuber is an enlarged underground stem, and the eyes on it are equivalent to the leaf buds on the stems of a young tree. Hence, when the seed (tubers) is expensive or a variety is new, the tubers are cut to secure the largest possible increase in the shortest time.

Although the crop is grown to a limited extent for domestic use by practically every farmer, the demand outside the Colony is never very great, with the exception of a small increasing export to the Belgian Congo. Potatoes, therefore, are never likely to be grown on anything like so extensive a scale in Rhodesia as such crops as maize, tobacco and ground nuts. Efforts have been made for some years by the Department of Agriculture to improve the yield and resistance to disease by testing new varieties and by seed selection. Salisbury district produces considerably more than half the total crop, with an average yield of just over 22 bags per acre, although individual yields of over 100 bags per acre are often recorded.

Climate and Soil.—The potato, while requiring a liberal supply of moisture to ensure plants of vigorous growth and, the formation of an abundant and well-shaped tuber crop, needs considerably less moisture as the time of harvesting the crop approaches. In fact, much rain at this time may result in considerable loss to the grower by injuring the flavour of the potato and greatly impairing its keeping or marketing quality. An unusually long continued spell of wet weather sometimes causes the entire crop to rot. Late rains following a drought, though not excessive, tend to create a renewal or second growth, which is very undesirable if the crop is intended for seed or market.

The soil considered best for potatoes is a deep friable loam, well stocked with humus. Whenever the land is naturally wet and heavy, the quality of the tubers is sure to be unfavourably affected. Dry and wet seasons have a natural influence with soils, and in heavy lands after a hot dry summer the crop may be abundant and of good quality, while if the summer is a wet one the plants succumb very readily to disease and the tubers will be of a watery, non-floury nature. If the soil is of a light, sandy nature, the cost of manuring and fertilising will be greater, but this will probably be compensated by tubers of better quality and less expense in handling than is required for working heavier soils. Owing to blight and other potato diseases, a clean crop cannot be grown successfully on the same ground year after year, thus making rotation with other crops essential.

Cultivation.—The potato demands more cultivation than almost any farm crop. The depth of ploughing is an important factor, as the soil should be in rather a loose, mellow condition. Cross-ploughing may be necessary if the land becomes set and hard before the seed is planted. If well-rotted manure is to be applied it should be spread over the surface before ploughing. If light, dusty kraal manure is used it may be applied to the land just before planting and disced in. A drag harrow should follow the disc harrow to work down the soil properly. Sometimes one harrowing will do, but two are usually better.

Selection and Preparation of the Seed.—Seed potatoes of a suitable size should be secured or saved from the previous crop. They should not be selected from diseased

Showing proper and improper sprouting of seed potatoes. Nos. 1 and 2 weak and spindly. No. 6 showing undersized seed. Nos. 3, 4 and 5 strong, sturdy sprouts.

A good crop of "Up-to-date" potatoes growing on Mr. E. Pope's farm, The Willows, Rusape.

"Majestic" potatoes at the Agricultural Experiment Station, Salisbury, 13th January, 1927.

crops, for unsound tubers cannot produce healthy, robust plants. Seed from a blighted crop, though apparently sound, may carry the disease, which is liable to be transmitted in turn to the produce of such seed. There is a considerable diversity of opinion as to the best size of seed to plant. Although it is scarcely possible to secure all seed of a uniform size, an effort should be made to avoid using either abnormally large or very small seed. Potatoes passed over a 1½in. sieve are a suitable size for planting. Large seed may be cut a day or two previous to planting, care being taken to leave two or three eyes in each portion. The cut surface should be dusted over with finely sifted lime or wood ash, which prevents or at any rate retards evaporation and prevents the entry of fungus diseases.

Potatoes grown year after year in the same locality and from the same seed deteriorate in productiveness and in their capacity to resist disease. Imported seed gives the best results, but its high cost often prohibits a profit being made on the crop. Therefore, every endeavour should be made to supply home-grown seed to a greater extent than has hitherto been done. Clamping or pitting for the storage of table and seed potatoes has not proved a success in this country, and seed that is required for planting should be stored in a dry shed and spread in layers of not more than 12 inches deep, protected from the sun, but exposed to the air. The free admission of air is important, and the greater the circulation the better. It has the effect of producing a slow and steady growth of sprouts which are much less liable to be knocked off at planting time than the long white sprouts produced in the dark. By sprouting the tubers and removing the sprouts their vitality is weakened, and a loss in yield is the result.

Planting.—The most suitable season for planting varies according to the climatic conditions of each district. The early potato crop grown with the aid of irrigation or on moist sandy vlei soils should be planted as early as possible—that is, as soon as danger from frosts is over. Nothing is gained by planting unsprouted tubers in soil that is cold and wet. As early potatoes usually command good prices, it is often worth taking the risk of frost if the soil and seed are in good condition. Covering with dry grass will often

ward off the effects of frosts. In order to participate in the early market, early varieties should be selected and sprouted before planting. Medium-sized tubers should be chosen—say, about 2 to 2½ ozs. in weight—placed in their layers in shallow boxes and put in a cool, dry, well-ventilated shed, a tobacco barn being excellent for this purpose. When the skin is slightly toughened and greenish in colour, the temperature may be slightly raised, which can be done without difficulty if a tobacco barn is used for storing. This will induce sprouting. When short, sturdy sprouts are produced the sets may be planted about 3 inches deep. The warmer the situation is the better. Very few varieties resent cutting, but it is best avoided in the early varieties. The main summer planting takes place from January onwards, and in this case the last date upon which they may be safely planted will depend upon the first frosts of winter. The amount of seed required to plant an acre will vary from 1,000 to 1,400 lbs., according to the size of the seed and the distance of planting.

There are two general methods adopted for planting: (1) by planting between ridges made by a shovel or ridging plough; (2) by planting behind an ordinary three-furrow plough. With the ridge system the tubers are planted at a more even depth and consequently come up more evenly, and they are planted in straighter rows, and for these reasons they are more evenly cultivated. Also, in growing the crop under irrigation this operation is greatly facilitated, as the water can quickly pass down the ridges and the land does not become water-logged. Another point in favour of the ridge system is that it makes digging and ploughing out the crop a comparatively easy task. If level culture is practised, some of the tubers are buried so deep that they are beyond the reach of the plough, or are bruised in the operation of lifting. Considering these points, the opinion is that the ridge system is the best one for crops planted under irrigation during August and September, and again for January crops grown during our heaviest rainfall.

On the flat system a three-furrow plough is generally used, taking furrows about 12 inches wide, and the "sets" are placed by hand along the side of the last furrow turned up. This leaves room for the oxen to walk in the bed of the furrow without stepping on or disturbing the sets. If

artificial manure is applied it is convenient and desirable to sow it in the furrow in which the potatoes are planted.

On a hot dry day it is advisable that the sets should be covered as soon as possible, as they get quickly scalded by the sun, and a poor stand or weak growth is the result. Soon after planting, the field should be harrowed with a light drag harrow once or twice. This is effective in keeping down the weeds and levelling the ridges left in planting. It will also help to conserve moisture by preventing the formation of a crust. No matter how carefully the seed has been planted and how much the land has been manured, if the soil is permitted to become hard and weedy the yield will be much reduced. As soon as the plants can be seen along the rows the cultivator should be used to loosen the soil between them. This will assist growth and permit of the proper enlargement of the tubers. Three or four cultivations should be ample, but the grower should be guided by soil and climatic conditions. Hand-hoeing will be necessary at least once or perhaps twice to destroy the weeds around the plants. When the plants are 6 to 8 inches high they should be "earthed" up with the ridge or shovel plough; as much earth as possible should be raised without covering the plants.

Lifting the Crop.—Good prices are usually obtained for early potatoes, and they may be dug as soon as they are considered large enough. Growers' ideas of readiness differ. Some dig as soon as the potatoes are as large as walnuts, but it would be wiser to postpone the operation until they are as large as a hen's egg, or even larger. The main crop grown for winter and spring markets is best left in the ground in which it is grown and lifted as required.

There are two general methods adopted in Rhodesia for lifting the crop: (1) natives digging with forks or grubbing with hoes; (2) the ridging or shovel plough. By removing the breasts, share and cutter, and substituting a special share and set of prongs, this plough can be converted into an efficient potato raiser.

When the plough is used the land will require to be harrowed several times to expose any tubers not previously gathered and to level the land. Very large losses result from faulty practices at the time of lifting the crop. Through

carelessness, lack of labour or other causes many growers allow their potatoes to be exposed to the hot sun after they are dug up, and potato scald develops. Although the damage may not be evident at the time of bagging, the injured tubers usually develop soft rot and become rotten and worthless during transport to market or soon after arrival at their destination. Potatoes should not be dug more rapidly than they can be picked and placed in the shade. Whether the potatoes are dug with hoes or ploughs, care should be taken to reduce the number of cuts and bruises. These offer an entrance for disease, besides damaging the appearance and causing waste.

Preparing for Market.—Intimately bound up with the whole matter of profitable potato growing is the demand of the market. It is not sufficient alone to grow potatoes, but it is equally necessary to send this product to market in a condition so as to be most acceptable to the buyer. Even a well-grown crop of potatoes may lose a large part of its value if not properly graded. Ungraded potatoes cannot compete with a graded sample on the market, except at a loss. The local merchant who buys potatoes either has to sell them at a lower price or he must grade them himself. In either case he pays the grower less. Appearance is a big factor in the sale of table potatoes. Grading is necessary in order to give the consuming public what it demands. The marketing of the crop harvested during January and February requires much care and attention. It is not a wise practice to dig in wet weather if it can be avoided, as both the bag and potatoes become covered with soil and unsightly when placed on the market. If they are bagged and stored, even for a few days, they will begin to "heat," and decay soon follows. The riper and drier the tubers are dug, the better are their keeping qualities.

Rotation for Potatoes.—An excellent rotation for the potato grower is a three-years' cycle of potatoes, maize and velvet or dolichos beans. The crop should be so arranged that a piece of bean land is always available for potatoes. This will do more to help to produce good yields than any other one thing, except the use of manure. Velvet or dolichos beans greatly improve the condition of the soil for potatoes, add fertility and, if ploughed under in autumn and

the land is thoroughly worked again in spring, leave it in the best of condition. One of the principal benefits to be derived from the above rotation is the control over insect and parasitic enemies. Potato rot, scab and other fungus diseases live in the soil as well as on the tubers, and time must be given between the potato crop to allow them to die out.

Disease and Pests.—Scab is a common disease and is found almost everywhere that potatoes are grown. Heavy dressings of kraal manure favour the development of scab, and should not be applied fresh to the crop. Potato blight attacks the leaves of the plants and appears in the form of grownish spots. The tubers are not affected, but if the disease attacks the crop during its growing period, much of the leaf surface is destroyed and the yield is greatly reduced. The Chief Entomologist recommends spraying an infected crop with Bordeaux mixture. The most serious pest which destroys potatoes in this country is the potato tuber moth, and, judging from reports received, it is on the increase. The moth is grey-brown in colour, about half an inch across the wings, and may, if disturbed, be seen making short flights in the potato field. It burrows its way into the cracks in the soil and lays its eggs generally in the eye of the potato. The eggs soon hatch out into small caterpillars, which burrow into and destroy the tubers. Generally only those tubers nearest the surface are destroyed. As a prevention, it is recommended that the potatoes in the ridges should be earthed up with as much soil as possible, in order to prevent the moth gaining access to the tubers. Potatoes left in the field after the previous season's harvesting provide the main harbour, and moths bred from these are on the wing and ready to infect the growing crop. It is advisable not to plant infected seed on land that is free from the pest.

Some of the pedigree Hereford cows with calves at Sandown Estate (property of Messrs. Wm. Cooper & Nephews, Ltd.).

Persian sheep at Sandown Estate (property of Messrs. Wm. Cooper and Nephews, Ltd.).

The Influence of Dipping in Solutions of Arsenic upon the Course of Trypanosomiasis.

By LL. E. W. BEVAN, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

The systematic dipping of cattle in solutions of arsenic, for the elimination of ticks and the diseases transmitted by them, has been widely practised in Southern Rhodesia for many years, with the result that several farms, and even larger areas, such as commonages and ranches, have been rendered tick-free. This is shown by the fact that cattle bred and reared on such areas, when later in life removed to tick-infested country, contract the tick-borne diseases and die from them.

The process of systematic dipping is based upon the work of Lounsbury, Theiler and Watkins-Pitchford, particularly the latter, who devised a dipping solution containing arsenic in which cattle could be dipped without harm at short intervals. He also found that, as the result of frequent immersion, the tissues of the animal developed a habituation or tolerance to the arsenic.

In his second report on "Dipping and Tick-destroying Agents" he states, "The effects from these frequent dippings appear to accumulate within the animal's system, producing as they accumulate a corresponding degree of tolerance or habituation on the part of the animal, the deeper layers of whose skin gradually become temporarily charged, so to speak, with arsenic, so as to render the beast poisonous to any ticks which may become attached." It was stated, however, that the excretion of the accumulated arsenic was rapid and that it could only be kept up by short-interval dipping. Further, it was found that the tolerance to arsenic

was rapidly acquired, but that some time elapsed before the maximum degree of tick-killing capacity was reached. The accumulation of arsenic was held to be "not a mechanical deposition or passive soaking, but rather a vital and active process." It was believed that any arsenic in excess of the maximum content was eliminated from the skin, "the elimination taking place through absorption by the blood vessels which are contained in its deeper layers, such excess of arsenic appearing shortly afterwards in the urine. When it is considered that it is into this deep layer of skin that the tick thrusts its mouth parts and obtains its nourishment, the significance of being able to establish a supply of arsenic at such a point of attack is seen."

The accuracy of this theory has recently been challenged, but the fact remains that in practice the total eradication of ticks from an area can be accomplished by short-interval dipping; and experiments in this Laboratory have shown that ticks sown upon a regularly dipped animal three days after the last dipping failed to develop, whereas others sown under similar conditions upon undipped animals came to maturity. This indicates that it is the residual rather than the in-contact arsenic which is the most important factor in the destruction of ticks.

It has frequently been suggested that this process might be made use of in the control of trypanosomiasis, and it was hoped that the arsenic absorbed as the result of frequent and regular immersion in arsenic-containing solutions might act in one or more of the following ways:—

1. By poisoning the tsetse fly taking up blood from the skin in which the arsenic had become deposited.
2. By destroying the trypanosomes in the flies imbibing such blood.
3. By rendering the fly infertile.
4. By protecting the animal into which infective material was injected by the fly in the act of biting.

It is, however, a well known fact that "fly-struck" cattle suffering from a mild or chronic form of trypanosomiasis, when exposed to heavy rains, will develop an acute

attack of the disease and rapidly die. It was therefore feared that the dipping of infected cattle might prove a "two-edged sword" and actually hasten the death of infected animals. To clear up this point the experiments recorded in this note were undertaken.

Unfortunately, in the absence of a number of naturally infected cattle and a suitable dipping tank, it was impossible to carry out the experiments on a sufficiently large scale at the Veterinary Research Station; it was therefore decided, as a preliminary step in the investigation, to watch the effects of dipping in arsenical and other solutions upon guinea pigs infected with the various strains of trypanosomes current at the Laboratory. In dipping these small animals great care had to be taken that none of the dip was swallowed, but in no case could death be attributed to this cause. One animal only died of arsenical poisoning through eating contaminated bedding. After this accident it was decided to place the guinea pigs after dipping in cages without bedding and in a warm, shady place to dry. On damp and overcast days drying was slow, and during the course of the experiments two animals died of scalding and absorption of arsenic. In other cases, as will be seen later, dipping had to be suspended because of scalding, and it was in such cases that the re-appearance of the trypanosome after its absence as the result of regular dipping was first observed.

The carrying out and recording of these experiments was in the hands of two separate assistants working at different times, and their records have been sorted out and re-arranged in order that the results may be presented in sequence.

It is recognised that the results obtained with guinea pigs may not hold good with cattle, but they appear to be sufficiently striking to justify publication in the hope that those with greater facilities and more time for research work may carry out further investigations on a larger scale.

Two strains of trypanosomes were used in these experiments—

1. A strain of T. brucei v. rhodesiense, obtained from a native who died in the Salisbury hospital, having contracted the disease in the Gatooma district.

2. A strain of T. brucei (indistinguishable from the above by morphological or other features) obtained from a donkey which was found dead of trypanosomiasis in the vicinity of the Linnet Mine, Sipolilo district.

It is regretted that the same strains, or strains of equal virulence, could not be used throughout the experiments, but owing to the unavoidable delays in the work, this was impossible.

The arsenical solution used in these experiments was prepared from Cooper's Improved Cattle Dip, which contains the equivalent of .16 per centum of arsenious oxide, and is used for the dipping of stock at three-day intervals in the strength of one gallon of dip to three hundred gallons of water; or for weekly dippings, in the strength of one gallon of dip to one hundred and fifty-six gallons of water.

It is claimed by the proprietors of this dip that it contains certain ingredients which increase its wetting power, "that is to say, the 'wetting power' of Cooper's Cattle Dip is eight times greater than that of arsenite of soda." It is also said that "the special ingredients by which this high 'wetting power' of Cooper's Cattle Dip is attained have also another useful effect, inasmuch as their action tends to raise the surface scales of the skin of the animals treated with this dip, thereby enabling the dip to penetrate more quickly and thoroughly to the lower tissues, from which the ticks imbibe their food and, at the same time, the poison which kills them." It is further claimed that "this 'wetting power' also is a great safeguard against 'scalding' or 'stripping,' as it is sometimes termed. With a dip which, instead of forming a uniform film on the skin, stands in drops and patches, the effects will be concentrated at the places where the drops and patches form, and that is why certain cattle dips, having low 'wetting power,' cause skin injury or 'scalding.' "

It may also be mentioned that this dip was mixed with rain water in order that the emulsion and "wetting powers" should be as perfect as possible.

In the following protocols the figures represent the number of trypanosomes counted in one hundred fields

examined under a 1-12th oil immersion objective and a No. 2 eye-piece, and the following signs are used:—

DW = Dipped in water.

D = Dipped in a 1 in 300 solution of Cooper's Improved Cattle Dip.

DD = Dipped in a 1 in 156 solution of Cooper's Improved Cattle Dip.

X = In a dying condition.

T = Treated with antimony or other drug.

SERIES 1.

Control.—Guinea pig inoculated with a strain of T. brucei exalted in virulence by passage through guinea pigs.

Guinea Pig No. 1.

Days.	Trypanosomes per 100 Fields.
0	Inoculated
1	
2	
3	
4	
5	
6	10
7	
8	
9	1
10	3
11	
12	
13	500
14	400
15	400
16	300
17	500
18	2,000
19	
20	300
21	Found dead

Group "A."—Experiment to ascertain whether the Immersion of Guinea Pigs in Cold Water, at Intervals before and after Infection with Trypanosomiasis, exerts any influence upon the course of the Disease.

Days.	Guinea Pig No. 2. Trypanosomes per 100 Fields.		Guinea Pig No. 3. Trypanosomes per 100 Fields.	
Before.				
11		DW		DW
10				
9				
8		DW		DW
7				
6				
5		DW		DW
4				
3				
2				
1		DW		DW
After.				
0	Inoculated with same virus as Control No. 1.		Inoculated with same virus as Control No. 1.	
1				
2		DW		DW
3				
4				
5				
6	1,400	DW	600	DW
7				
8	1,000		1	
9	100	DW	5	DW
10	2,000		7	
11				
12				
13	1,000	DW	500	DW
14	500	DA, X	600	T, X
15	2,000		0	
16	2,000	DD	0	
17	1,000		0	
18	300		0	
19				
20	1	DD	0	
21	0		0	
22	0		0	

Summary.—In guinea pig No. 3 the trypanosomes multiplied more rapidly than in the control. Both animals were in a critical condition on the fourteenth day after inoculation, and the disease had to be arrested by treatment.

Conclusion.—The immersion of guinea pigs in cold water at intervals of three or four days before and after infection with trypanosomiasis hastened the course of the disease.

SERIES 2.

Experiment to ascertain whether the Immersion of Guinea Pigs at Short Intervals in a Solution of Cooper's Improved Cattle Dip, 1 part in 300 parts of Cold Water, protects against Infection with Trypanosomiasis or exerts any Curative Effect.

Control.—Guinea Pig No. 1, Series 1.

Group "A."—Protective Effect.

The following guinea pigs were dipped four times in solutions of Cooper's Improved Cattle Dip, 1 in 300, at intervals of three days. They were then inoculated with the same strain of T. brucei as the control, and afterwards dipped twice a week:—

Days.	Guinea Pig No. 4. Trypanosomes per 100 Fields.		Guinea Pig No. 5. Trypanosomes per 100 Fields.	
11		D		D
10				
9				
8		D		D
7				
6				
5		D		D
4				
3				
2				
1		D		D
0	Inoculated		Inoculated	
1				
2		D		D
3				
4				
5		D		D
6	0		0	
7	0		0	
8	0		10	
9	1	D	3	D
10	4		1	
11	1			
12				
13	1	D	2	D
14	0		7	
15	0		7	
16	8	D	17	D
17	2		9	
18	0		8	
19				
20	1	D	26	D
21	2		100	
22	2		200	
23	6	X, DD	500	X, DD
24	0		400	
25	8		600	
26	10		1,500	
27	100		1,000	

Summary.—The trypanosome increased in numbers more slowly than in the control animal, but in guinea pig No. 5 eventually increased with great rapidity.

Group "B."—Protective and Curative Effect.

The following guinea pigs were first inoculated with the same strain of T. brucei as the control, and were subsequently dipped twice a week in a solution of Cooper's Improved Cattle Dip, 1 in 300:—

Days.	Guinea Pig No. 6. Trypanosomes per 100 Fields.		Guinea Pig No. 7. Trypanosomes per 100 Fields.	
0	Inoculated		Inoculated	
1				
2		D		D
3				
4				
5				
6	100	D	100	D
7				
8				
9	2	D	5	D
10	2		3	
11				
12				
13	200	D	400	D
14	400		200	
15	250		150	
16	800	D	250	D
17	1,200		1,000	
18	800		700	
19				
20	3,000	D	2,000	D
21	100 per field		3,000	
22	Dead		2,000	T

Summary.—The course of the disease was not arrested by dipping in 1 in 300 solution twice a week after infection.

Group "C."—Curative Effect.

The following guinea pigs were inoculated with the same strain of T. brucei as the control, and on the appearance of trypanosomes in the peripheral blood were dipped twice a week in Cooper's Improved Cattle Dip, 1 in 300:—

Days.	Guinea Pig No. 8. Trypanosomes per 100 Fields.		Guinea Pig No. 9. Trypanosomes per 100 Fields.	
0	Inoculated		Inoculated	
1				
2	0			
3				
4				
5				
6	0		0	
7	0			
8				
9	8	D	10	D
10	7		2	
11				
12				
13	2	D	0	D
14	2		2	
15	40		4	
16	20	D	16	D
17	5		22	
18	3		14	
19		D		D
20	10		200	
21	50		2,000	X
22	10	DD	Found dead	
23	54			
24	100			
25	150			
26	200			

Summary.—The trypanosomes increased less rapidly in number than in the control, but the course of the disease was not arrested.

Conclusion.—The submersion of guinea pigs in solutions of Cooper's Improved Cattle Dip, 1 in 300, at short intervals, before and after inoculation, did not exert any appreciable protective or curative effect.

SERIES 3.

Experiments to ascertain whether the Immersion of Guinea Pigs, at short intervals, in a Solution of Cooper's Improved Cattle Dip, 1 in 156 of Cold Water, protects against Trypanosomiasis.

Controls.—Guinea pigs Nos. 10 and 11, inoculated with a strain of T. brucei.

	Guinea Pig No. 10.	Guinea Pig No. 11.
Days.	Trypanosomes per 100 Fields.	Trypanosomes per 100 Fields.
0	Inoculated	Inoculated
7	12	30
11	6	36
14	45	175
18	560	1,310
20	1,130	1,420
24	Found dead	
25		440
29		385
32		90
35		240
39		130
42		160
46		195
49		280
53		Found dead

Group "A."—Protective Effect.

The following guinea pigs were inoculated with the same strain of T. brucei as the controls, and ten minutes after were dipped in Cooper's Improved Cattle Dip, 1 in 156, and were subsequently dipped at short intervals in dip of the same strength:—

Days.	Guinea Pig No. 12. Trypanosomes per 100 Fields.		Guinea Pig. No. 13. Trypanosomes per 100 Fields.	
0	Inoculated. Ten minutes after inoculation dipped in 1-156 Cooper's Improved Cattle Dip.		Inoculated. Ten minutes after inoculation dipped in 1-156 Cooper's Improved Cattle Dip.	
4	0	DD	0	DD
7	0	DD	0	DD
11	0	DD	0	DD
14	0	DD	0	DD
18	0	DD	0	DD
21	0	DD	0	DD
25	0	DD	0	DD
29	0	DD	0	DD
32	0	DD	0	DD
35	0	DD	0	DD
39	0	DD	0	DD
42	0	DD	0	DD
46	0	Dipping ceased	0	DD
49	0		0	DD
50			Found dead. Arsenical poisoning by absorption	
53	1			
56	3			
61	35			
64	260			
67	1,000			
70	4,000			
74	2,000			
77	1,300			
81	3,000	Died		

Summary.—The dipping of guinea pig No. 12 in Cooper's Improved Cattle Dip, 1 in 156 cold water, ten minutes after inoculation with a strain of T. brucei, and thereafter at intervals of three and four days, delayed the appearance of the trypanosomes in the peripheral blood, but did not prevent infection. Seven days after the cessation of dipping, trypanosomes appeared and the disease ran a rapid course. Similarly, in guinea pig No. 13 the appearance of trypanosomes was arrested during the period of dipping.

Conclusion.—The immersion of guinea pigs in solutions of Cooper's Improved Cattle Dip, 1 in 156 cold water, as above, arrests the development of the trypanosome so long as dipping is continued, but does not eliminate the parasite which appears in the peripheral blood shortly after the cessation of dipping.

SERIES 4.

Experiment to ascertain whether the Immersion of Guinea Pigs infected with Trypanosomiasis in Solutions of Cooper's Improved Cattle Dip, 1 part in 156 Cold Water, exerts any Curative Effect.

Controls.—Guinea Pigs Nos. 14 and 15, inoculated with a strain of T. brucei v. rhodesiense obtained originally from a native (native strain).

Days.	Guinea Pig No. 14. Trypanosomes per 100 Fields.	Guinea Pig No. 15. Trypanosomes per 100 Fields.
0	Inoculated	Inoculated
9	1	20
13	90	250
14	228	408
16	396	795
17	930	840
19	1,320	1,500
20	1,900	1,700
23	2,040	1,080
26	1,300	1,500
30	788	900
33	1,500	1,460
37	820	1,450
39	1,030	1,860
44	990	1,670
48	800	640
51	990	185
54	1,170	520
58	130	1,200
61	350	570
65	740	710
68	75	580
72	28	520

Days	Guinea Pig No. 14. Trypanosomes per 100 Fields	Guinea Pig No. 15. Trypanosomes per 100 Fields
75	500	1,190
80	55	460
83	24	570
86	230	3,000
		Died
89	500	
93	Found dead	

N.B.—The duration of the disease in these animals was longer than in the guinea pigs inoculated with the donkey strain of T. brucei.

Group "A."—Curative Effect.

The following guinea pigs were inoculated with the same strain of trypanosomiasis as the control guinea pigs Nos. 14 and 15 (blood from the same syringe), and short-interval dipping in Cooper's Improved Cattle Dip, 1 in 156 cold water, was commenced on the thirteenth day, i.e., four days after the appearance of trypanosomes in the peripheral blood:—

Days.	Guinea Pig No. 16. Trypanosomes per 100 Fields.		Guinea Pig No. 17. Trypanosomes per 100 Fields.		Guinea Pig No. 18. Trypanosomes per 100 Fields.	
0	Inoculated		Inoculated		Inoculated	
9	3		5		2	
13	50	DD	215	DD	170	DD
14	20		188		46	
16	6	DD	212	DD	18	DD
17	16		138		36	
19	5	DD	292	DD	178	DD
20	4		202		292	
23	0	DD	48	DD	260	DD
26	0	DD	0	DD	195	DD
30	0	DD	0	DD	2	DD
33	0	DD	0	DD	0	DD
37	0	DD	0	DD	0	DD
39	0	DD	0	DD	0	DD
44	0	DD	0	DD	0	DD
48	0	DD	0	DD	0	DD
51	0	DD	0	DD	0	DD

	Guinea Pig No. 16.			Guinea Pig No. 17.		Guinea Pig No. 18.	
Days		Trypanosomes per 100 Fields		Trypanosomes per 100 Fields		Trypanosomes per 100 Fields	
54		0	DD	0	DD	0	DD
58		0	DD	0	DD	0	DD
61		0	DD	0	DD	0	DD
65		0	DD	0	DD	0	DD
66		Dipping suspended.		Found dead. Arsenical poisoning by absorption.			
68	2	0				0	DD
72	6	0				0	DD
75	9	0				0	
						Dipping discontinued on account of scalding.	
80	14	0				0	
83	17	0				0	
86	19	0				0	
89	22	0				0	
93	27	0				0	
96	30	0				0	
100	34	0				0	
103	37	0				0	
104	38	0				0	
						Found dead. Cause unknown.	
107	41	0					
114	48	0					
131	65	1					
142		0					
161		200					
205		Found dead					

Summary.—The immersion of guinea pigs infected with T. brucei v. rhodesiense in a solution of Cooper's Improved Cattle Dip, 1 in 156 cold water, at short intervals (three and four days), after the appearance of trypanosomes in the circulation, caused the disappearance of the parasites from the peripheral blood. In guinea pigs Nos. 16 and 17 the trypanosomes disappeared after four such dippings, and in guinea pig No. 18 after six dippings.

In guinea pig No. 16 the trypanosomes were not eliminated, since they re-appeared 65 days after the cessation of dipping. The animal died of trypanosomiasis 74 days after the re-appearance of the parasite. This is about the average duration of the disease in guinea pigs infected with this strain.

Conclusion.—The dipping of guinea pigs when infected with trypanosomiasis in solutions of Cooper's Improved Cattle Dip, 1 in 156 cold water, arrests the course of the disease, but does not eliminate the parasite, which re-appears after the cessation of dipping.

SERIES 5.

Experiment to ascertain whether it is the Accumulation of Arsenic which Causes the Disappearance of Trypanosomes from the Peripheral Blood of Infected Guinea Pigs.

Control.—As in Series 1, Guinea Pig No. 1.

Group "A."

The following guinea pigs were first dipped in solutions of Cooper's Improved Cattle Dip, 1 in 300, and later in 1 in 156 solution at short intervals. Finally they were dipped in the latter strength on two or more consecutive days:—

	Guinea Pig No. 19.		Guinea Pig No. 20.	
Days.	Trypanosomes per 100 Fields.		Trypanosomes per 100 Fields.	
0	Inoculated with T. brucei as with control.		Inoculated with T. brucei as with control.	
1				
2				D
3				
4				
5				
6	0		0	D
7	0		0	
8	0		0	
9	9	D	1	D
10	7		4	
11			...	

Days	Guinea Pig No. 19. Trypanosomes per 100 Fields		Guinea Pig No. 20. Trypanosomes per 100 Fields	
12	...		...	
13	2	D	1	
14	2		0	
15	40		0	
16	20	D	8	D
17	5		2	
18	3		0	
19	0		0	
20	10	D	1	D
21	50		2	
22	10		2	
23	54	DD	6	DD
24	100		0	
25	150		8	
26	200		10	
27	200	DD	100	DD
28	250	DD	200	DD
29	20	DD	20	DD
30	4		0	
31	0		0	
32	0	DD	0	DD
33	0		0	
34	0	DD	0	DD
35	0		0	
36	0	DD	0	DD
37	0		0	
38	0	DD	0	DD
39	0		Dipping suspended. Parasites re-appeared 29 days after, and the animal died in 14 days.	
40	0			
41	0	DD		
42	0			
43	0	DD		
44	...			
45	...	DD		
46	...			
47	0	DD		

Days	Guinea Pig No. 19. Trypanosomes per 100 Fields		Guinea Pig No. 20. Trypanosomes per 100 Fields
48	0		
49	0	DD	
50	0		
51	0	DD	
52	0		
53	0	DD	
54	0		
55	0	DD	
56	0		
57	0	DD	
	Dipping suspended. Parasites re-appeared 23 days after.		

Summary.—The dipping of these guinea pigs in the weaker strength of Cooper's Improved Cattle Dip did not arrest the development of the trypanosome or cause its disappearance from the peripheral blood, and a single dipping in 1 in 156 solution was no more successful. When, however, the animals were dipped on three successive days in the strong solution, the parasites disappeared, but re-appeared after dipping was suspended.

SERIES 6.

It has been stated that cattle naturally infected with trypanosomiasis, and regularly dipped, do not respond so satisfactorily to treatment with antimony potassium tartrate as undipped cattle.

Experiment to ascertain whether the Trypanosomes in a Guinea Pig regularly Dipped in an Arsenical Solution (Cooper's Improved Cattle Dip, 1 in 300 Solution), become Antimony Resistant.

Guinea Pig No. 21.

Days.	Trypanosomes per 100 Fields.	
0	Inoculated	
2		D
6	100	D
7		
8		
9	5	D
10	3	
11		
12		
13	400	D
14	200	
15	150	
16	25	D
17	1,000	
18	700	
19		
20	2,000	D
21	3,000	
22	2,000	
	Received injection of antimony pot. tart. and arsenic solution	
23	0	
24	0	
25	0	
26	0	
27	0	
28	Used for another experiment	

Summary.—The trypanosome developed rapidly, in spite of dipping in Cooper's Improved Cattle Dip, 1 in 300, six times at short intervals. It did not become antimony resistant.

Experiment to ascertain whether the Trypanosomes of a Guinea Pig Treated with Antimony become Arsenic Resistant.

Guinea Pig No. 22.

Days.	Trypanosomes per 100 Fields.
0	Inoculated
1	
2	
3	
4	
5	
6	100
7	
8	1
9	5
10	7
11	
12	
13	500
14	600
	Received injection of antimony pot. tart. and arsenic solution
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	4
24	4
25	10
26	2
27	2
28	1

Guinea Pig No. 22.

Days	Trypanosomes per 100 Fields	
29	4	
30	6	
31	8	
32	150	
34	300	
35	500	
36	500	
37	1,000	
38	500	
39	500	DD
40		DD
41	22	DD
42	1	DD
43	0	DD
44	0	DD
45	...	DD
46	...	DD
47	...	DD
48	0	DD
49	0	DD
50	0	DD
51	0	DD
52	...	DD
53	0	DD
54	0	DD
55	0	DD
56	Died—"scalded"	

Summary.—The trypanosomes of this animal disappeared from the peripheral blood as the result of treatment with antimony potassium tartrate and arsenic, but on their reappearance were susceptible to dipping in arsenical solutions (Cooper's Improved Cattle Dip, 1 in 156).

This experiment also demonstrates the extraordinary resistance (habituation) of guinea pigs to dipping in solutions of arsenic.

SERIES 7.

Experiment to ascertain whether the Trypanosome remains in the Blood during the Interval when it cannot be found by Microscopic Examination of Blood Smears.

Guinea pig No. 23 was inoculated with 1 c.c. of citrated blood taken from guinea pig No. 16 on 24th February, 1925, at a time when trypanosomes had been absent from the peripheral blood for 74 days. On 26th March, 1925, 56 days after the cessation of dipping, trypanosomes re-appeared.

Guinea Pig No. 23.

Days.	Trypanosomes per 100 Fields.
0	Inoculated
13	0
30	0
	On this date trypanosomes re-appeared in Guinea Pig No. 16
41	0
60	0
147	0
247	0

Summary.—Blood from a guinea pig from which trypanosomes had disappeared as the result of dipping did not prove infective, although the parasites re-appeared when dipping was suspended.

It is intended to carry out further experiments to ascertain the "hiding place" of the trypanosomes during such intervals.

SERIES 8.

Experiment to ascertain whether the Dipping of Cattle in Solutions of Arsenic (Cooper's Improved Cattle Dip, 1 in 156) exerts any Protective or Curative Effects.

Three yearling animals were used for this experiment. Ox No. 110 was used as a control, and Nos. 117 and 124 were dipped for different periods prior to 27th February, 1925, when all three animals were inoculated with 1 c.c. of virulent blood from ox No. 155, infected with a strain of T. brucei originally obtained from a donkey dead from trypanosomiasis. On the previous day this ox had shown

200 parasites in 100 fields. The dipped animals were taken to the public dipping tank and were dipped in a solution of "weekly strength," i.e., 1 in 156.

Group 1.

Date.	**Ox 110** (control).	**Ox 117.** Dipped twice a week since 31-12-24, *i.e.*, 16 times	**Ox 124.** Dipped once a week since 14-2-25, *i.e.*, twice
	Not dipped		
27.2.25	Inoculated with 1 c.c. citrated blood of Ox 155	Inoculated with 1 c.c. citrated blood of Ox 155 Dipping suspended	Inoculated with 1 c.c. citrated blood of Ox 155 Dipping suspended
	Trypanosomes per 100 Fields	Trypanosomes per 100 Fields	Trypanosomes per 100 Fields
6.3.25	0	9	3
7.3.25	1	18	50
9.3.25	2	15	0
11.3.25	Not dipped	Dipping re-commenced once a week	Dipping re-commenced once a week
12.3.25	0	0	0
14.3.25	1	0	0
17.3.25	0	0	0
19.3.25	0	0	1
23.3.25	0	0	0
25.3.25	1	1	1
30.3.25	1	0	0
6.4.25	1	Crithidial forms	0
7.4.25	...	1	...
9.4.25	...	1	...
17.4.25	2	0	0
22.4.25	0	0	0
27.4.25	0	0	0
4.5.25	0	0	0
11.5.25	0	0	0
22.5.25	0	0	0
4.6.25	0	1	0

Experiment discontinued

Summary.—These experiments were inconclusive, because the control animal at no time revealed a large number of trypanosomes. Cattle Nos. 117 and 124 became infected with trypanosomes notwithstanding previous dipping. The trypanosome also in them became fairly numerous until dipping was resumed. These animals continued to be dipped weekly, and lived until April, 1926, remaining in good condition in spite of a very heavy wet season, during which they were exposed night and day. On the 4th April No. 117 was found sick and unable to rise, but no parasites could be found in its blood. It was probably suffering from herbal poisoning, and was destroyed. No. 124 is still alive and in good condition.

Further experiments were made with cattle which were inoculated with a strain of T. congolense var. pecorum, obtained from an ox naturally infected. The parasites, however, even in the control, were so scarce in the peripheral blood that no definite conclusions could be drawn. All that can be said is that both dipped and undipped animals lost condition rapidly; but as dipping was only practised once a week and the heavy rains probably prevented absorption, no good results could be expected.

DISCUSSION.

The foregoing experiments, although unfortunately few in number and occasionally inconclusive, indicate that the dipping of guinea pigs infected with trypanosomiasis in arsenic-containing solutions of certain strength and at certain intervals brings about the disappearance of trypanosomes from the peripheral blood. The parasite, however, is not eliminated, since when dipping is discontinued it again appears after a longer or shorter interval, and the disease thereafter runs its usual course as if never interrupted.

The result appears to depend upon two factors:—

1. The strength of arsenic in the solution.
2. The frequency of the immersion.

In Series 2, where weak solutions of Cooper's Improved Cattle Dip (1 in 300) were used, the parasite was not driven from the blood even when the animals were immersed at intervals of three days or twice a week. In Series 3, however, when solutions of 1 in 156 were used, the parasites

disappeared after three, four or six dippings at intervals of three or four days.

Again, the dipping of guinea pigs in the weaker strength (1 in 300) appears to exert little or no protective effect against syringe infection. Whether it would do so against natural infection by the tsetse or other blood-sucking flies is, of course, a different matter, and can only be determined by field experiments. On the other hand, the dipping of guinea pigs within a few minutes of syringe infection, and thereafter in weekly strength of Cooper's Improved Cattle Dip, 1 in 156, at intervals of three and four days (twice a week), did not entirely protect the animals, but arrested the development of the parasite until the dipping was suspended, after which sooner or later the trypanosome re-appeared.

There is some evidence to suggest that the frequency of the dipping is an important factor. For example, in Series 5, guinea pigs Nos. 19 and 20, the parasite was not caused to disappear by dipping at short intervals in 1 in 300 solution, or by three immersions in 1 in 156 solution; it was only after dipping in the latter strength on three consecutive days that the parasite disappeared and remained absent.

All the foregoing facts appear to indicate that the effect of the dipping upon the parasite is due to the absorption of arsenic and its gradual accumulation, and that it acts by suppressing or arresting the development of the trypanosome rather than by destroying it. When the drug, or may be the immune bodies resulting from the inter-action between parasite-drug and body tissues, are eliminated, the development of the parasite is resumed. The lengthy period which in some cases elapsed between the cessation of dipping and the re-appearance of the parasite points rather to the wearing out of immunity than to the elimination of the drug.

The experiments indicate that the immersion of guinea pigs infected with trypanosomiasis in cold water hastens the course of the disease. This corresponds with the practical observation that "fly-struck" cattle, when exposed to heavy rains, rapidly succumb. It is also highly probable that the dipping of infected cattle in solutions of arsenic too weak to affect the trypanosome might exert a similar harm-

ful effect. Indeed, reports from the field indicate that this is actually the case.

Another point of interest, and one having a practical bearing, is that such thin-skinned animals as guinea pigs should tolerate immersion at even daily intervals in a solution of arsenic prescribed for the weekly dipping of cattle. It would be interesting to ascertain whether shorter intervals of dipping in arsenic solutions of the prescribed strengths might not be equally well supported by cattle. This would be of immense benefit in the eradication of the brown tick (R. appendiculatus), which is responsible for the transmission of East Coast Fever; or of the striped-legged tick (H. ægyptium), which is notably difficult to destroy by weekly dipping.

It is also of interest to note that the dipping of the guinea pigs at frequent intervals in the stronger solutions was well tolerated, provided drying was rapid. "Scalding" took place chiefly during wet weather, when drying was slow. It is known that with cattle "scalding" is more likely to occur in dull damp weather after a spell of rain, when the atmosphere is saturated with moisture, than when dipping takes place during rain or when rains wash the arsenic from the animals after dipping. If the principle of short-interval dipping in solutions of arsenic over the strength usually employed is adopted for the treatment of cattle suffering from trypanosomiasis, it will only be practicable during weather favourable for rapid drying.

If, as would appear from the experiments, the absorption and accumulation of arsenic as the result of frequent immersions in arsenic-containing solutions is capable of arresting the development of the trypanosome, it may be that it will exert a similar effect upon other hæmatozoa. For example, it might possibly arrest the development of Theileria parva, the causal organism of East Coast Fever. Such a possibility was advanced by me in my annual report for 1919, in which I drew attention to—

" . . . certain circumstances in connection with recent outbreaks which suggest that the regular dipping of infected cattle every three days in standard solutions of arsenic may lead to a suppression of the disease. This is indicated by (1) the large proportion of deaths among oxen, as compared

with other classes of cattle, on certain infected farms during the winter, when tick life was practically dormant; and (2) the recrudescence of the disease in many outbreaks where regular dipping has been practised as a method of control during those months when the rainfall is heaviest. This is well indicated in the tables showing the monthly losses in outbreaks for the last ten years.

"The high mortality among oxen as compared with cows and calves cannot be solely attributed to tick infestation. Even if a number of ticks protected in the brush of the tail may escape the effects of the dip, all classes of cattle would be equally susceptible. It might, however, be due to the more rapid elimination of the residual arsenic from working animals through sweating and urinating during exercise.

"It has frequently been observed that certain animals which at the commencement of an outbreak have shown clinical manifestations of the disease have apparently recovered and have lived through the dry season to die of an acute form of the disease during the rains. It may be that in such animals highly impregnated with arsenic the development of the parasite picked up by them at the commencement of the outbreak is checked, and is only completed when the residual arsenic in them is exhausted, as might well be the case during the latter part of the rainy season, when the dipping tanks are flooded by storm waters and the dip is washed off by rains before it can be absorbed.

"It was shown by Watkins Pitchford, in his report on 'Dipping and Tick-Destroying Agents,' Part II., Schedule 'D,' that the infective process of African Coast Fever was retarded in the habituated animal from an average period of incubation of nine to sixteen days. The number of animals comprising his experiments, however, was small, and some of the cattle exposed failed to become infected. It is possible that a more exhaustive investigation might show that the development of the parasite in 'dipped' animals is prolonged for a longer period than hitherto suspected. The possibility of a suppressed form of African Coast Fever as the result of short-interval dipping is a matter of practical importance and deserving of the closest investigation in the laboratory and in the field."

Or again the occasional survival of imported bulls, although not inoculated, on farms where dipping is regularly practised, may possibly be due to the effect of the arsenic on the piroplasms and anaplasms in the peripheral blood. It is certain that these animals do become infected, although the infection is not manifested by any appreciable sickness or "set-back," because after a time they can be exposed with impunity upon tick-infested veld.

These considerations indicate the desirability of further experiments to ascertain the effects of short-interval dipping in strong solutions of arsenic upon the common hæmatozoal parasites of cattle.

It is to be regretted that the few experiments attempted with cattle proved inconclusive owing to the scarcity at any time of trypanosomes in the blood, even of the control animals, which prevented any comparison being made. It is hoped, however, to obtain a strain of trypanosome characterised by plentiful and constant supplies of parasites in the peripheral blood, so that the influence of the dipping may be accurately followed.

I wish gratefully to acknowledge the assistance I have received from Messrs. P. Huston, M.R.C.V.S., G. Gordon, M.R.C.V.S., and A. J. Crisp in connection with the numerous observations recorded in this report.

Domestic Water Supplies and Sanitation on the Farm.

(Continued.)

By P. H. Haviland, B.Sc. (Eng.), Assistant Irrigation Engineer.

Storage Tanks and Reservoirs.—The amount of storage necessary is contingent on the aspects of each particular scheme. In the case of pumping by means of a windmill, as has been previously stated, it is advisable to allow storage sufficient for windmill delivery of up to seven days. If motive power is obtained from an engine requiring continuous attention while running, it will be convenient to pump only every three or four days to reduce operating expenses, and storage must therefore be provided sufficient for the demands for that period, together with an extra supply in case of breakdown. Where water is delivered continuously, as by gravitation or a hydraulic ram, very little storage is necessary, and a reservoir or tank need only be installed to act as a stabiliser for flow of water through the distribution system; but here again it is advisable to keep a surplus storage as a precaution in case of failure in operation. As a rule a storage for a three days' supply should be provided.

The tanks or reservoirs may be constructed of various materials—iron, brick, concrete or masonry. The following tables give the dimensions of tanks and reservoirs for various capacities:—

Stock Sizes of Circular Corrugated Galvanised Iron Tanks.

Capacity (gallons).	Height (feet).	Diameter.
500	6	4ft. 3in.
1,000	6	5ft. 10in.
1,500	8	7ft. 6in.
2,000	8	9ft. 0in.

Inside Diameters of Circular Reservoirs (6ft. deep).

Capacity (gallons).	Inside Diameter.
5,000	13ft. 0in.
10,000	18ft. 5in.
15,000	22ft. 7in.
20,000	26ft. 1in.
25,000	29ft. 2in.

Inside Dimensions of Square Reservoirs (6ft. deep).

Capacity (gallons).	Inside Dimensions.
5,000	11ft. 7in. x 11ft. 7in.
10,000	16ft. 4in. x 16ft. 4in.
15,000	20ft. 0in. x 20ft. 0in.
20,000	23ft. 1in. x 23ft. 1in.
25,000	25ft. 10in. x 25ft. 10in.

Iron Tanks.—The most usual type is the circular corrugated galvanised iron, which is obtainable in various sizes. As a rule these tanks, particularly in the case of the smaller sizes, are made of ordinary galvanised iron, but ingot iron is strongly recommended. Up to 2,000 gallons capacity the thickness of iron usually used in the sides is No. 24 S.W.G. (standard wire gauge); the bottoms should be of No. 22 gauge. Up to 5,000 gallons the sides are of No. 22 gauge and the bottoms of No. 20 gauge. It is better to use for 5,000 gallon sizes iron of No. 20 gauge throughout.

The tops of large tanks should be reinforced with an angle iron ring to give rigidity. All tanks should be coated inside and out with some anti-corrosive paint, such as a bitumastic solution. It is very advisable to have the tanks mosquito-proofed, and care must be taken to see that both the inlet and overflow pipes are protected. The overflow pipe may be suitably protected by carrying the end inside the tank below the surface of the water, as shown in Figure X. It is advisable to have a scour valve placed at the bottom of the tank for cleansing purposes, but, where convenient, the outlet pipe may be utilised for this. Rectangular metal tanks may also be used, constructed of flat plates, but as a rule these are not suited to small farm supplies on account of their high cost. Should they be installed, however, it may be noted that the leakage which

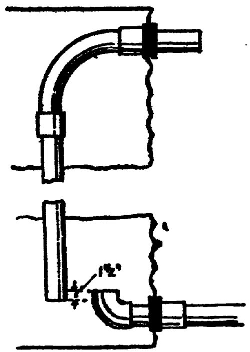
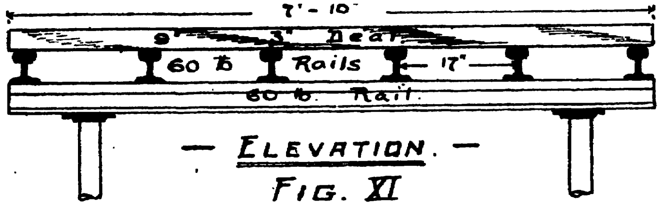


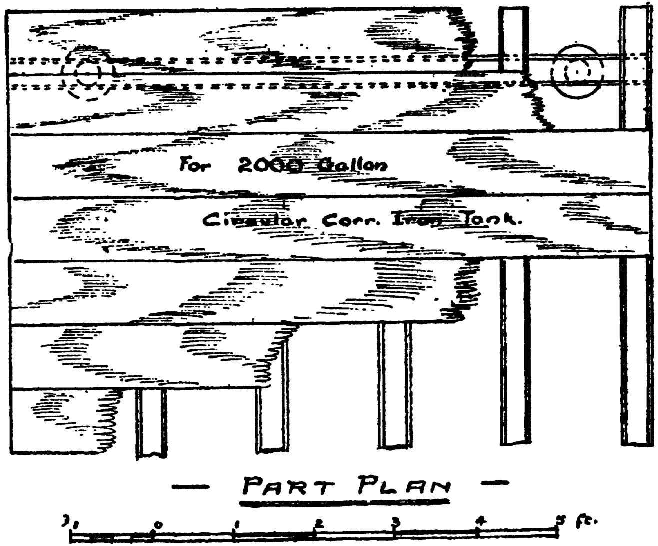
FIG. X

SEALED OVERFLOW

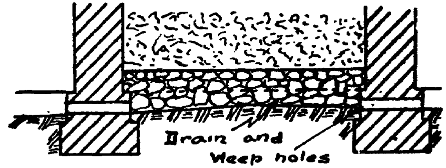


— ELEVATION. —

FIG. XI

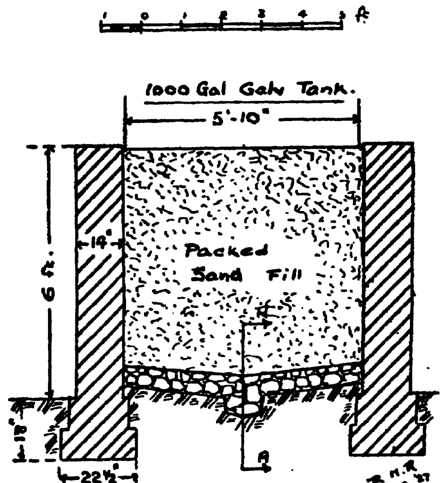


— PART PLAN —



— SECTION AA —

FIG. XII



usually occurs immediately after erection will cease as the joints take up.

There are several forms of tank stands which may be utilised for carrying circular metal tanks. Where a tank is required to be set at a fairly high elevation—from, say, 8 feet to 25 feet—the most suitable type of stand is the tubular. This consists of uprights of piping stayed with smaller horizontal pipes and braced with round mild steel diagonals.

The top of the stand may consist of iron rails; second-hand 60-lb. are suitable, with deals laid on top. (See Figure XI.)

The sizes of pipes to be used depend upon the capacity of the tank to be carried, and may be safely left to commercial firms supplying this type of stand. A badly made stand of this type is unsafe, and the farmer would be advised to purchase ready for erection.

For tank stands up to 6 feet or 7 feet in height, brick, masonry or concrete may be used. The stand may be either solid or hollow. The latter type is very effective. A circular stand consisting of a ring of brick work or masonry set in cement with sand or rubble filling is recommended. If sand filling is used it is advisable to make the inside diameter of the ring slightly larger than the diameter of the tank. The reason for this is that in the event of the sand filling settling down, it will not leave the tank supported only round its circumference, as might occur if the tank overlapped the brick or masonry ring.

It is advisable to place a drain at the bottom of the stand to drain all water away from the filling. The sand, which must be clean and free from clay or vegetable matter, should be placed with water in order to effect as full consolidation as possible. The sand is dumped in dry and then well soaked with water, care being taken to see that the water has passed right through. The whole is then left to dry undisturbed. Figure XII. shows a tank stand of this type, and a detail of the drain construction is also given. The brickwork ring must be 14 inches thick at least and should rest on a footing of 22-inch brickwork carried 12 to 18 inches below ground surface.

In place of sand, broken rubble filling may be used. The rubble may consist of broken stone, hard, well-burnt brick, furnace cinder, etc. It must be well consolidated by tamping and should be topped off level with the ring by means of a layer of 1.4.8 concrete with cement plaster finish. The concrete is made up as follows:—

1 part by volume of cement.
4 parts by volume of clean sharp river sand.
8 parts by volume of clean sharp stone broken to pass a ring of 1 inch diameter.

Consolidation is absolutely necessary to prevent settlement occurring later, but a drain is not required.

Where a very low tank stand is required, these methods may also be used, but up to 2 feet in height a corrugated iron ring sand-filled may be used instead of brickwork or masonry. This ring will have to be of larger diameter than the tank. A drain is necessary for this.

A very useful fitting to any tank is a "depth tell-tale," enabling the depth of water in the tank to be seen at once by means of a pointer on a cord.

The appearance of tank stands may be improved by growing varieties of light creepers on trellis work round about, but heavy creepers which may work their way into crevices in the masonry or brickwork must be avoided.

Brick Tanks.—Brick tanks may be constructed of either reinforced or plain brickwork and may be set above the ground surface or in excavation. As regards the shape of a tank, the circular is the most economical, as it requires less material than any other shape for an equal capacity. The disadvantage of circular tanks is the difficulty in covering them. A covering of reinforced concrete may, however, be conveniently used, consisting of a slab carried on beams. The sizes of slab and beams for a covering will depend upon the size of the tank, and designs for any specific size may be obtained from the Government Irrigation Engineer. It is not advisable to build tanks wholly on ground surface, and construction wholly or partly in excavation is to be recommended. The most suitable depth for small tanks is about 6 feet, and if necessary 3 feet may be in excavation and 3 feet above ground surface. The portion

above ground surface must, however, be backed by means of an earth bank. This bank should be made in layers not exceeding 6 inches in depth and must be well consolidated by tamping during construction.

The slope of the bank should be about 2 to 1. That is, for every 1 foot in height the width of the base will be 2 feet, plus the width of the top of the bank. For a bank 3 feet high, with a top width of 1 foot 6 inches, the base will be $(3 \times 2) + (1' \ 6'') = 6' + (1' \ 6'') = 7' \ 6''$.

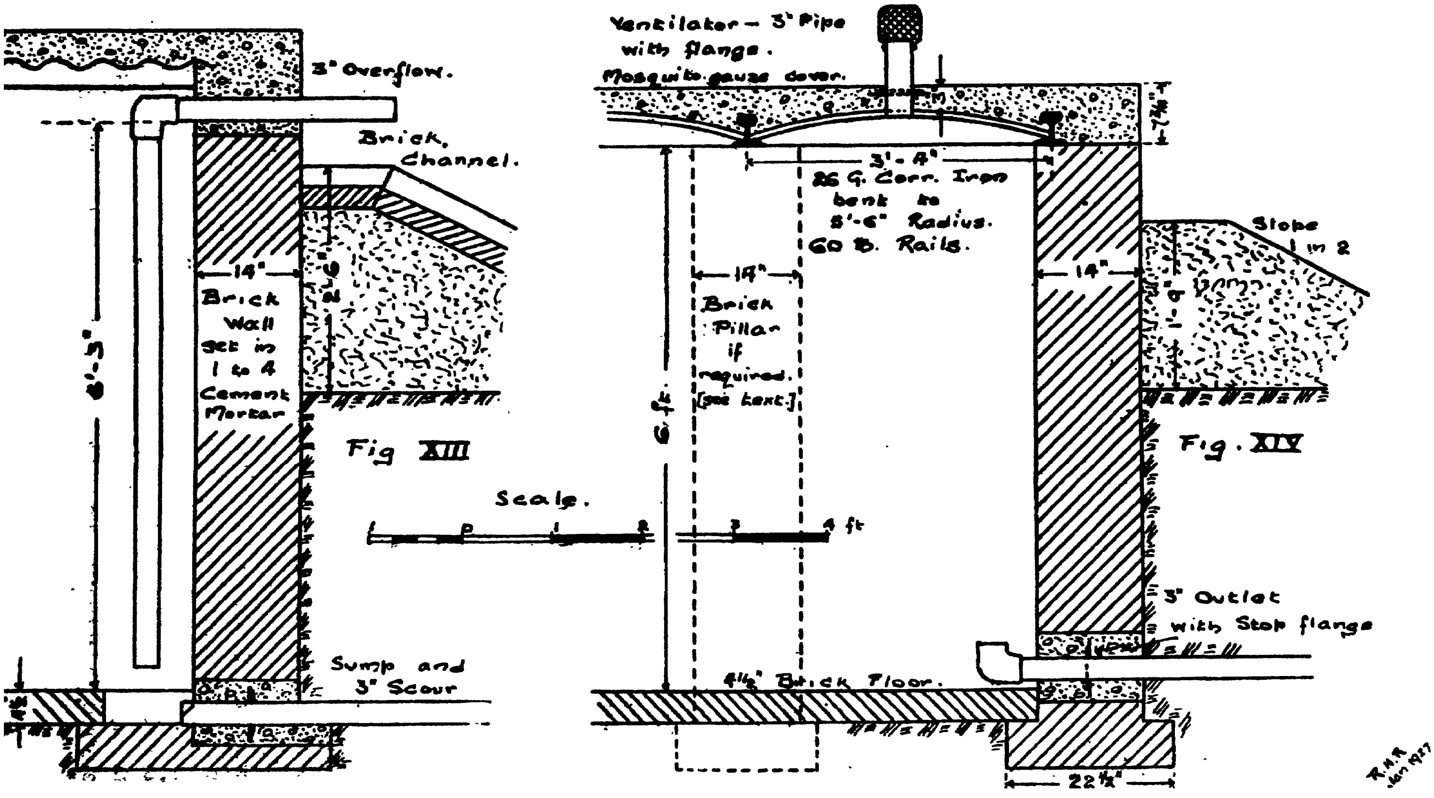
The thickness of brickwork for the top 3 feet may be 9 inches, backed with an earth bank, and for the lower 3 feet, 14-inch brickwork should be used. The brickwork must be laid in cement mortar (1 part of cement to 3 parts of clean sharp sand) and must be plastered about $\frac{5}{8}$ inch with a 1 to 2 cement plaster. The footings may be made of 24-inch work gradually reducing to 14-inch work over a minimum depth of 1 foot 3 inches, or else 1.3.6 concrete may be used. The floor may be constructed of $4\frac{1}{2}$-inch masonry, brick on edge or reinforced concrete 4 inches thick.

If reinforced concrete is used the reinforcement should consist of a square mesh of $\frac{3}{8}$-inch round mild steel rods 12 inches apart. Great care must be taken to see that the site is cleared of all roots and is well consolidated.

An overflow pipe must be provided, and a scour pipe with controlling valve must also be put in. The latter should take out from a small sump set below the level of the floor and may be of 2-inch or 3-inch pipe. The draw-off pipe should be set above the floor of the tank in order to prevent the drawing off of any sediment which may have collected. The end of the draw-off pipe may be bent up to effect this. All pipes should be embedded in concrete of 1.3.6 proportions where they pass through the walls. A mosquito-proofed ventilator should also be put in. Figures XIII. and XIV. show details of the above items.

If 9-inch brickwork is used above ground level the top width of the earth bank should be at least 2 feet 6 inches, but if 14-inch is used the width may be made very small.

One form of concrete covering suitable for rectangular tanks is shown in Figure XIV. This consists of a series of jack arches formed of 1.3.6 concrete over No. 26 gauge corrugated galvanised iron bent to the radius shown. This


3" Overflow.
Brick Channel.
14"
Brick Wall set in 1 to 4 Cement Mortar
6'-3"
Sump and 3" Scour
Fig XIII
Scale.
1 0 1 2 3 4 ft
Ventilator – 3" Pipe with flange.
Mosquito gauze cover.
3'-4"
26 G. Corr. Iron bent to 8'-6" Radius.
60 lb. Rails.
14"
Brick Pillar if required. [see text.]
6'-4"
4½" Brick Floor.
Slope 1 in 2
Fig. XIV
3" Outlet with Stop flange
22½"
R.M.R. Jan 1927

is a very convenient form of covering, as no shuttering is required for the arches. It should not be used, however, for brick walls less than 14 inches thick. The jack arches are supported by second-hand 60-lb. rails, the ends of which rest on the walls of the reservoir. Should the span exceed 12 feet, 14-inch brick pillars must be built to support the rails at the centre of the span. A manhole will be necessary in this roof, and this may easily be boxed out while the concrete is being poured. The manhole should be covered with a heavy metal cover set flush with the top of the roofing and making a mosquito-proof joint with it. If the length of the tank exceeds 15 feet an expansion joint should be placed. This may be done by placing a piece of tarred paper in a vertical position along the top of one of the central rails to break the concrete covering into two parts.

A reinforced brickwork tank can also be constructed. This type must be very carefully built, as its strength depends wholly upon adhesion between the materials. The thickness of the wall is 4½ inches, and for a depth of 6 feet the lower 3 feet are reinforced by 2 strands of No. 10 fencing wire between each course. The top 3 feet are reinforced between each course alternately with 2 strands and 1 strand. The whole is set in 1.3 cement mortar. The footings should taper to 12 inches wide and should be constructed of 1.3.6 concrete.

The bricks must be well soaked before laying, and the whole should be plastered on the inside with cement plaster of 1 to 2 proportions.

Concrete Tanks.—These are of two kinds—plain and reinforced concrete. The former requires a great deal of cement and the latter requires steel reinforcement. If the tank is wholly in excavation in solid rock or a very compact formation (other than earth), a skin of concrete only will be necessary to make it water tight. This may be plain 1.2.4 concrete about 4 inches to 6 inches thick. But if the formation is such that it would slip or slide if saturated and not supported in any way, a skin would not be enough, and other construction will be necessary. Figure XV. shows sections of walls of concrete reservoirs suitable for the latter case. In dealing with concrete the reader is referred to Bulletin No. 588, "Concrete on the Farm,"

CONCRETE AND MASONRY WALL SECTIONS

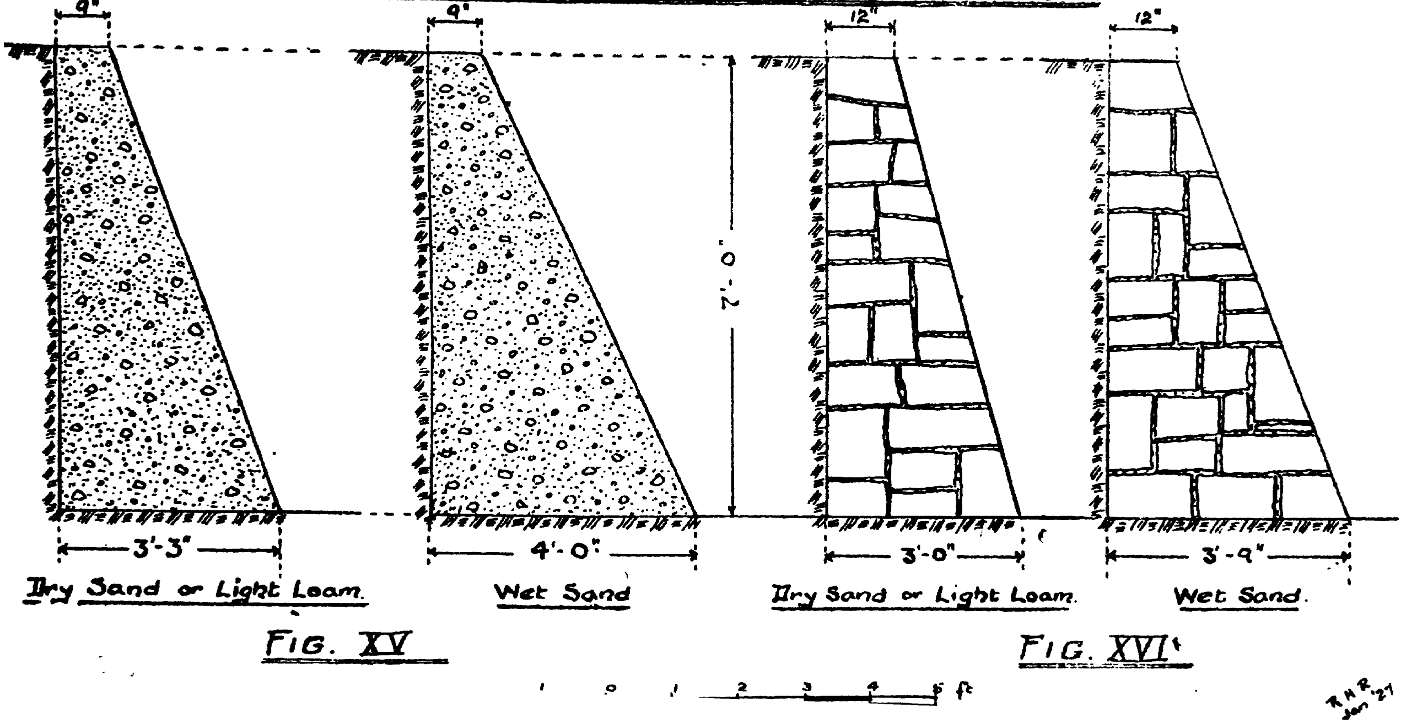


FIG. XV

FIG. XVI

reprinted from the *Rhodesia Agricultural Journal* of April, 1926.

Covering and floors of such tanks are of similar construction to those described for brick tanks. Other fittings are also similar.

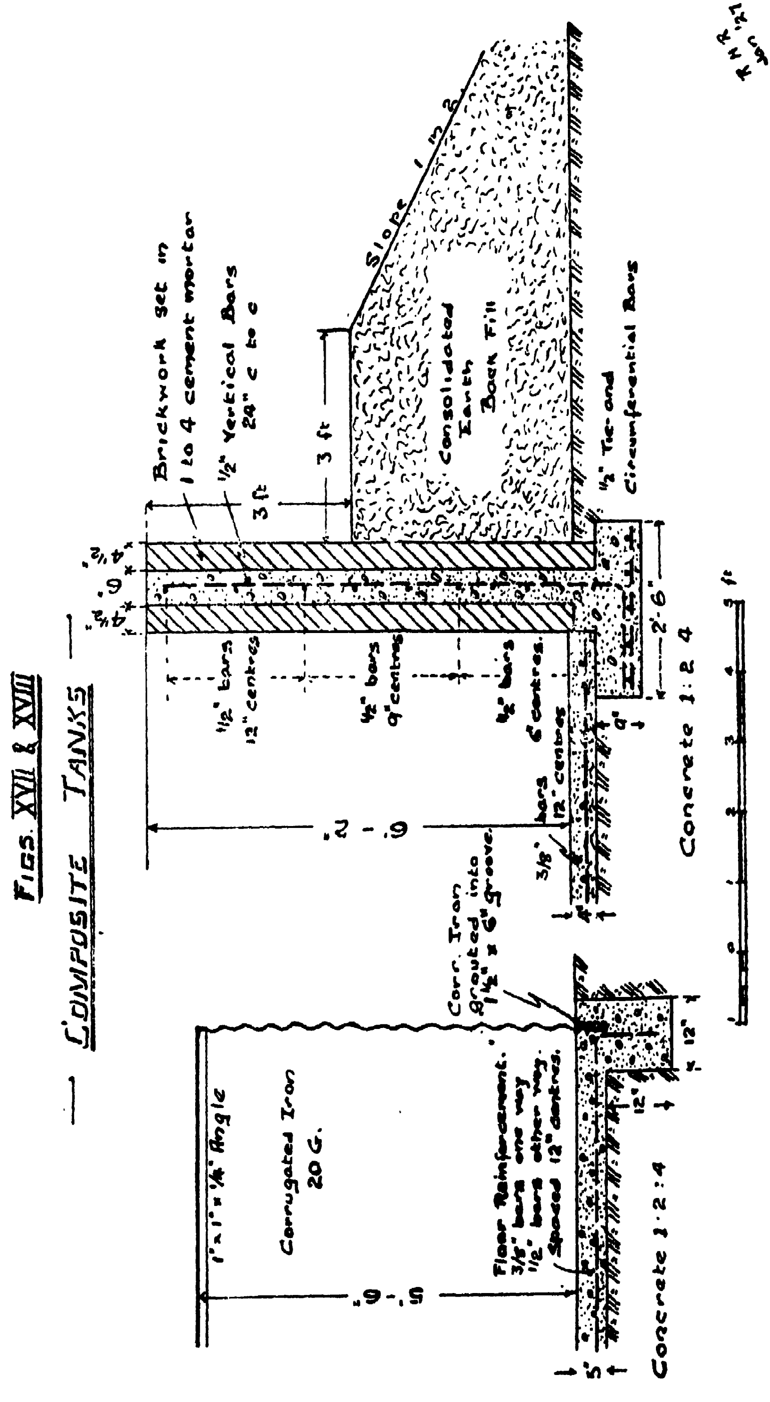
Masonry Tanks.—These are cheaper to construct than concrete tanks where a plentiful supply of good building stone is available. All masonry must be set in 1.3 cement mortar and may or may not be plastered, although plastering is recommended. Vertical joints should not extend more than two courses. The stones should be greater in base than in height. All stones must be laid on their natural bedding planes. Soft stones are not suitable, and stones which weather easily should be avoided. Suitable building stones are granites, diorites, dolerites, felsites, etc.

The general remarks on brick and concrete tanks apply equally to masonry. Figure XVI. shows suitable sections of walls.

Composite Tanks.—Tanks may be constructed of composite type. A circular tank with corrugated iron wall and a concrete floor may be constructed, although the useful life of the iron is limited. This is an effective form of construction where the bottom of an iron tank has corroded to such an extent that repair is impossible. The best thing to do is to turn the tank upside down and set it in a concrete floor. If the sides have also corroded, the whole may be set in concrete, the iron acting to a certain extent as reinforcement. In this case it is best to place the concrete inside the tank.

Another form of composite construction is brick and concrete. Two thin walls of 4½-inch brickwork are built with a hollow between, and this hollow is then filled up with 1.3.6 concrete. By this means saving is effected over plain concrete, as no shuttering is necessary. Figures XVII. and XVIII. show two composite types.

Purification of Water.—As has been previously stated, no water can be considered as fit for domestic consumption unless it has been proved so by means of bacteriological and chemical analyses. Flood waters which may be potable are very often discoloured by silt held in suspension, and other


FIGS. XVII & XVIII
COMPOSITE TANKS
Brickwork set in 1 to 4 cement mortar
1/2" Vertical Bars 24" c to c
3 ft
3 ft
Slope 1 in 2
Consolidated Earth Back Fill
1/2" Tie and Circumferential Bars
4 1/2"
6"
4 1/2"
1/2" bars 12" centres
1/2" bars 9" centres
1/2" bars 6" centres
6' - 2"
3/8" bars 12" centres
9"
2' 6"
4"
Concrete 1: 2: 4
Corr. Iron Grouted into 1 1/2" x 6" Groove.
1" x 1" x 1/4" Angle
Corrugated Iron 20 G.
Floor Reinforcement. 3/8" bars one way 1/2" bars other way. Spaced 12" centres.
12"
12"
5' - 6"
5"
Concrete 1: 2: 4
R.M.R. Jan '21

waters also frequently contain solids in suspension. These should be got rid of before the water is consumed. There are various methods of purification of water, such as filters and addition of chemicals, but, should any of these methods prove too costly to adopt, water should be boiled for a period of not less than 15 minutes. In order to ensure that complete sterilisation is effected, it is best to bring the water to boiling point and then allow it to stand and cool off for a period, after which continual boiling for 15 minutes should be carried out.

Domestic Filters.—The ordinary small domestic sand filter is very effective in removing solids held in suspension, but must never be relied upon as a germ-destroying apparatus nor as a means of getting rid of mineral salts in solution. The action of these filters is purely screening. They promote purity, but are no excuse for the consumption of contaminated water. Figure XIX. shows a small filter of this type constructed of concrete, capable of supplying about 300 gallons in 24 hours, with a clear water tank below. If the water contains sediment so fine that it is not able to be filtered out, chemicals may be added to the water before it enters the filter in order to cause precipitation or coagulation. The chemicals usually added are alum and lime or sodium carbonate; about 4 to 6 grains of alum per gallon is usual, but it is inadvisable to use any chemicals without first obtaining expert advice.

Slow sand filters of the larger type, if constructed properly, are effective in removing bacteria. After water has been passed through for some time at a slow rate, a scum or mat of gelatinous substance is formed on top of the sand. In this, bacteria, algæ, protozoa, etc., are entangled, and this mass of organisms, together with the air, effects the destruction of organic matter. Water-logging of the filter must be avoided, as this prevents aeration, and the purification is carried out chiefly by aerobic organisms requiring air. The rate of filtration must not exceed 4 inches per hour or 450 gallons per square yard of filter surface in 24 hours. The gelatinous mat must be removed at intervals, or otherwise the amount of water passing through in a given time will be greatly diminished. The period between removals depends on the quality of the water being filtered.

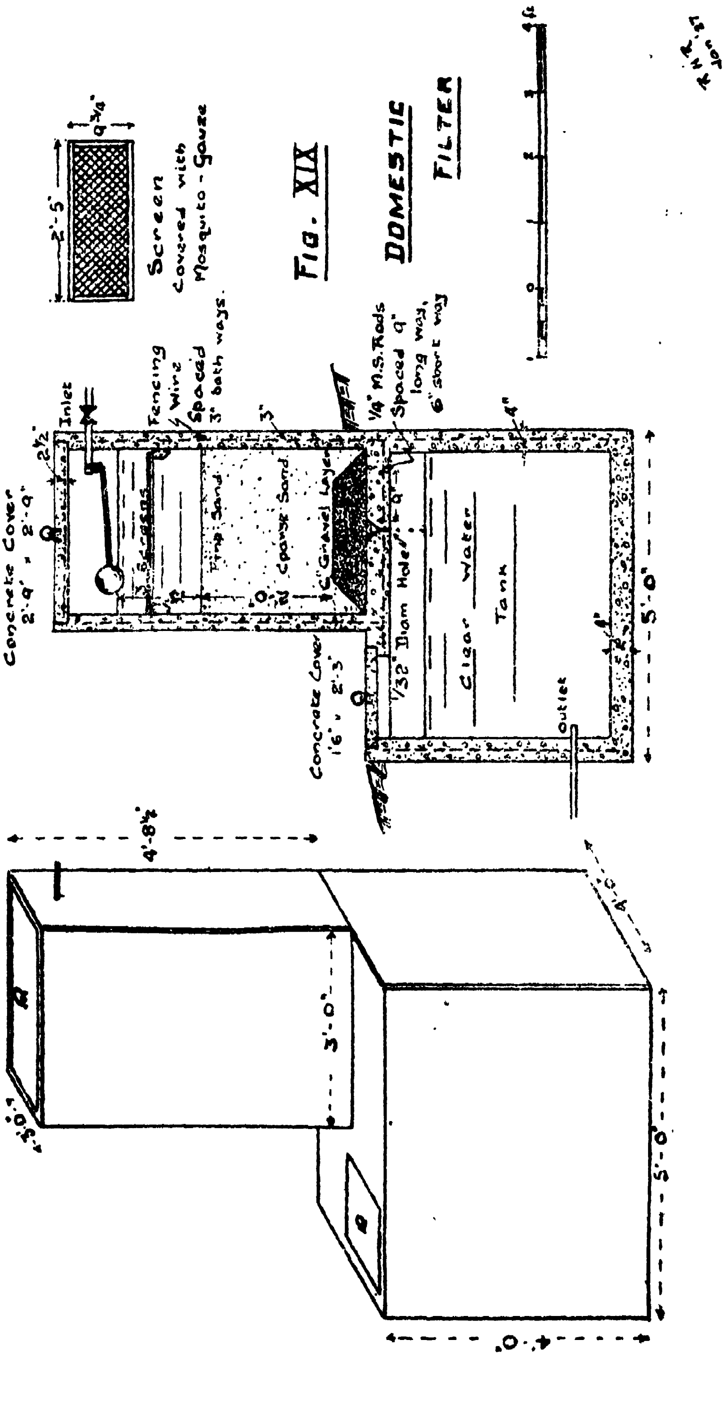


FIG. XIX
DOMESTIC FILTER

After the mat is removed the sand must be washed in purified water and then replaced. Water should then be passed through for two or three days and allowed to run to waste, after which period the new mat will commence to function. On this account it will be necessary to duplicate the filters. The top layer of sand is the most important and should consist of sand which is wholly free from any clay, vegetable or organic matters. It must be well washed first. The lower sand beds contain grains larger in size than those above. Each layer should consist of grains of a diameter slightly less than three times the diameter of grains in the bed immediately above. The grains in the layer at the bottom must be sufficiently large to prevent them passing through the drains. Figure XX. shows a slow sand filter capable of supplying about 4,000 gallons in 24 hours, but farmers are advised to obtain advice from this branch before installing large slow sand filters. Other filters of the mechanical, pressure or gravity type are obtainable, and these are very efficient, the only drawback being the somewhat high price. Sizes suitable for small quantities of water are obtainable. There are many proprietary makes of small domestic filters on the market made of a great variety of materials and adapted to fit direct to taps and to operate separately. The farmer is warned against the use of any make which has not been definitely proved to be effective. In general, filters containing cloth, sponge, paper, asbestos, charcoal or similar materials are to be avoided. In these types bacteria may easily increase in number in a very short time and be passed through the filter, thus polluting the supply of what should be pure water. The only filters which have been proved to be capable of retaining bacteria are of the Pasteur-Chamberland and similar types. This type contains "candles" or tubes of porcelain, through which filtration is effected, the water passing into the "candle" from the outside. The disadvantage of this filter is the slow speed of operation, which is only about half a gallon per tube per day without pressure and about 6 gallons per day with pressure. The Berkefeld filter is a similar type, and filtration is effected through infusorial earth or "kiesulguhr." This filter should be sterilised daily.

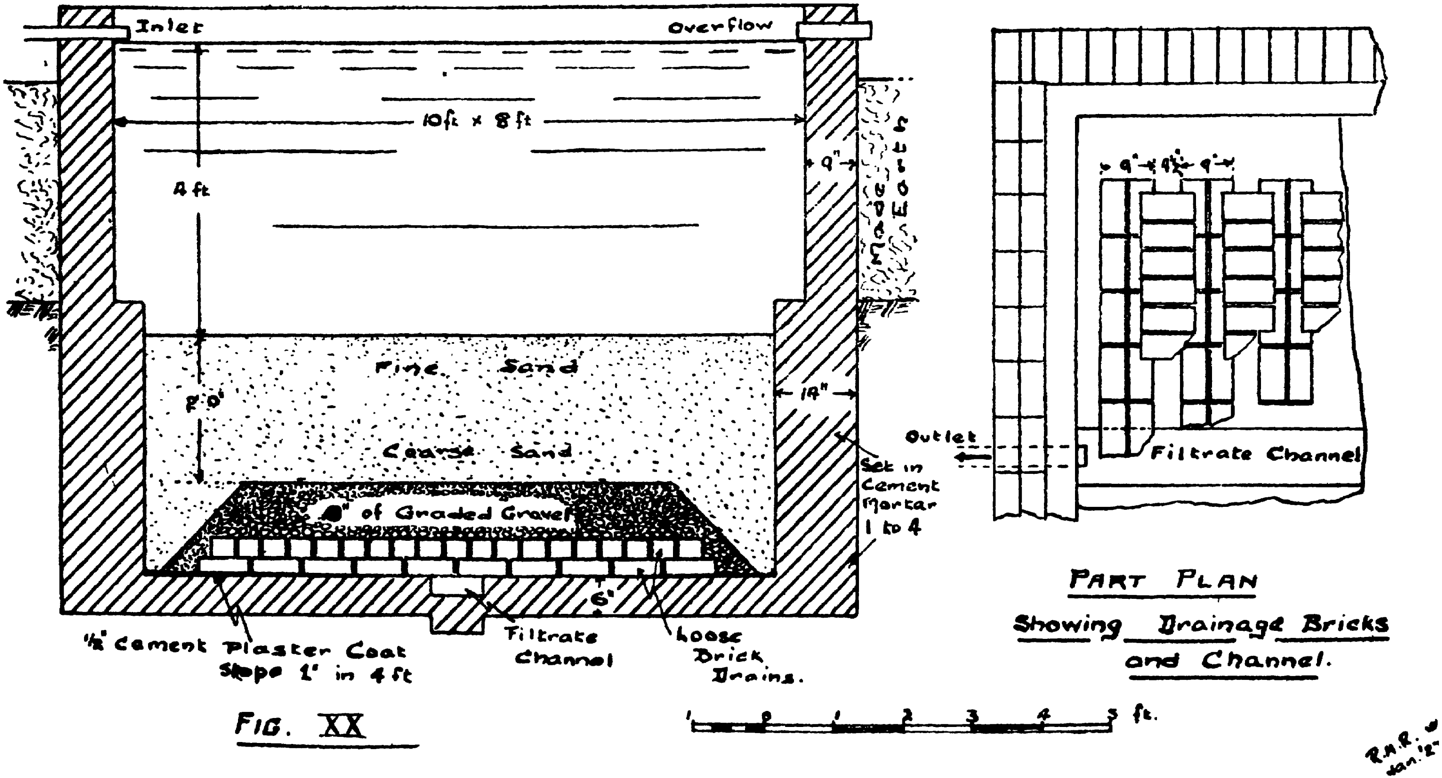

Inlet
Overflow
10ft x 8ft
4 ft
9"
Made Earth
Fine Sand
Coarse Sand
2'0"
18"
8" of Graded Gravel
6"
Outlet
Set in Cement Mortar 1 to 4
½" Cement Plaster Coat
Slope 1' in 4 ft
Filtrate Channel
Loose Brick Drains.
9" 4½" 9"
Filtrate Channel
PART PLAN
Showing Drainage Bricks and Channel.
1 0 1 2 3 4 5 ft.
R.A.R. Jan. '12

FIG. XX

Sterilisation.—Water may be rendered fit for potable purposes by sterilisation. The best method is undoubtedly by thorough boiling, but in the case of large demands this is not a practical proposition, and consequently other methods are adopted.

Chloride of Lime.—Make up a stock solution by dissolving 3 teaspoonfuls of fresh chloride of lime (bleaching powder) in 2½ quarts of water. This solution should be kept in a glass stoppered bottle. The bottles sold by any chemists as "Winchester Quart Bottles" hold approximately 2½ quarts, and these will prove very suitable for keeping the stock solution in. This solution gradually loses its strength, and so fresh solutions should be made up occasionally. For sterilisation, add 3 teaspoonfuls of the stock solution to each 5 gallons of water, mix thoroughly and allow it to stand for 30 minutes, after which the water will be fit to drink.

Tincture of Iodine.—The ordinary tincture of iodine containing about 2½ per cent. of iodine may also be used for sterilisation. To 1 gallon of water 4 drops of tincture must be added and mixed in, and the water will be fit for consumption 30 minutes afterwards.

Sterilisation while Travelling.—In this country there is a great tendency when travelling to drink any water, irrespective of the source from which it comes. This is an exceedingly bad practice for which there is no excuse, and the sufferers from disease contracted in this manner have only themselves to blame. Preparations put up in tabloid form, which are most effective as sterilising agents, are obtainable locally. In some of these the water after treatment has an acid taste (citric acid), which is not unpalatable. In others there is no taste at all after treatment. For carrying about while on a journey they are extremely useful, occupy practically no space and take a very short time to effect sterilisation. The farmer is strongly advised to keep a bottle or container of these in the house.

(To be concluded.)

ERRATUM.

Under caption "Quantity of water consumed," seventeenth line, page 1114, December, 1926, for "and for" read "but not for."

Hints to Tobacco Growers.

GLEANED FROM A VISIT TO ENGLAND.

By H. K. BRACKWELL, Ruia, Umvukwes.

During a visit to the Home country last year my wife and I had the privilege of visiting one of the largest tobacco factories in England, viz., that of Messrs. W. D. & H. O. Wills, at Bristol. Through the kindness of the managing director, Mr. Walters, we were conducted over the whole maze of buildings, from the rooms where the bales and hogsheads are first received to the despatching offices, where the cigarettes and tobacco are ready for the consumer.

The brains that have been used to invent the marvellous machines were the first thing to strike me, and to see the way in which the machines placed the cigarettes in cartons and the ounce packets of tobacco in their carefully sealed wrappers was perfectly amazing. During my visit to the bale receiving room, Mr. G. W. Anson, the buyer of the Imperial Tobacco Company (who paid a visit to Rhodesia last year), showed me some bales of Rhodesian leaf which had just arrived. The condition and baling of the leaf were very favourably reported on. I was surprised to see so little scrap on the outside of the bale, which speaks well for the packers in our warehouse here. I certainly did notice some broken leaf in the middle of the bales, but I was given to understand that this difficulty would be got over if the tobacco were put through a "Procter Re-ordering Machine."

Here I should like to mention that I saw several leaves on the outside of the bale which had indications of the borer; whether this had emanated from the farm grading sheds or whether it had found its way into the bales in transit between our warehouse and the steamship is hard to say. I have

been strongly advised, as a precaution, to fumigate all sheds in which tobacco is stored on the farm, and also that it would be advisable for every grower to do the same during the next month.

With the rapid expansion of the industry in this Colony several new growers will doubtless be commencing on their first year, and I should like to issue a word of warning:—Don't plant more acres than can be successfully cured in the tobacco barns available. I consider twelve to thirteen acres per barn ample. Don't plant after the 31st December, as the temperature during the nights when the leaf is maturing, if planted after this date, is considerably cooler, and the leaf grows coarser and is difficult to cure. Don't cure the tobacco green. The manufacturers in England will not buy green tobacco; and unless every precaution is taken to avoid the green leaf, I am afraid the growers will find themselves saddled with a considerable quantity of unsold leaf.

I have gone into the question of heating tobacco barns, mainly with an eye to reducing the amount of fuel used, and also to more consistent maintaining of the temperature. Plans and specifications for heating apparatus have been drawn up by a leading firm of heat engineers in England, which I hope to place before the hon. the Minister of Agriculture and Lands with a view to getting his sanction for the erection of such a barn at the Tobacco Experiment Farm. If proved successful, this, I feel sure, would be of great benefit to all growers.

I visited the farm in Hampshire, owned by Mr. A. J. Brandon, where tobacco is being grown on a small scale. When it is considered that he was heating his barns by super-heated steam, and the fuel used was coke, which at the time of my visit was £3 to £4 a ton (the high price being due to the coal strike), it is difficult to see how tobacco can be grown at a profit in England with labour at 7d. per hour, as compared with 6d. to 7d. a day here.

I had some sample thermometers and hygrometers made and sent them to the manager of the Rhodesia Tobacco Warehouse and Export Company, Limited, who was satisfied with them, and I understand that a consignment has already arrived for sale to members of the company.

At the request of Mr. Walters, the land settlement officer at Crown House, Aldwych, I interviewed several prospective settlers who were contemplating growing tobacco in Rhodesia, and my advice to all of them was—50 acres of tobacco, four barns and grading sheds. I consider the latter most essential, as I can foresee a lot of inconvenience and delay to the grower who has no grading facilities, as the existing grading warehouses will not be able to cope with more than a quarter of the crop grown in 1927.

FUMIGATION WITH HYDROCYANIC ACID GAS AGAINST THE CIGARETTE BEETLE (*LASIODERMA SERRICORNE*).

With reference to Mr. Bracewell's remarks on the subject of fumigation, the Chief Entomologist writes:—

Fumigation with hydrocyanic acid gas is now commonly employed against the above pest. An air-tight store of course is necessary.

For treatment of both store and bales, the following strength appears to be that most commonly used, namely:—

> Sodium cyanide, 2½ lbs. to each 1,000 cubic feet of space.

The gas needs to be generated in an earthenware vessel or an enamelled one without cracks in the enamel. For each ounce by weight of sodium cyanide use one and a half fluid ounces of commercial sulphuric acid and three fluid ounces of water. The generating vessel should have a capacity of about a pint for each ounce of cyanide used. Add the acid to the water in the vessel (not *vice versa*), and when all is ready for rapid exit the cyanide can be slipped in with a paper shovel or dropped in wrapped in thin paper. The door should be closed immediately, locked and sealed. The building may apparently with advantage be kept locked for forty-eight hours. It must be thoroughly aired before re-entry.

For treatment of a building alone a smaller dosage should, I think, be sufficient—say, one ounce to each 100 cubic feet of space—providing the building is air-tight. It

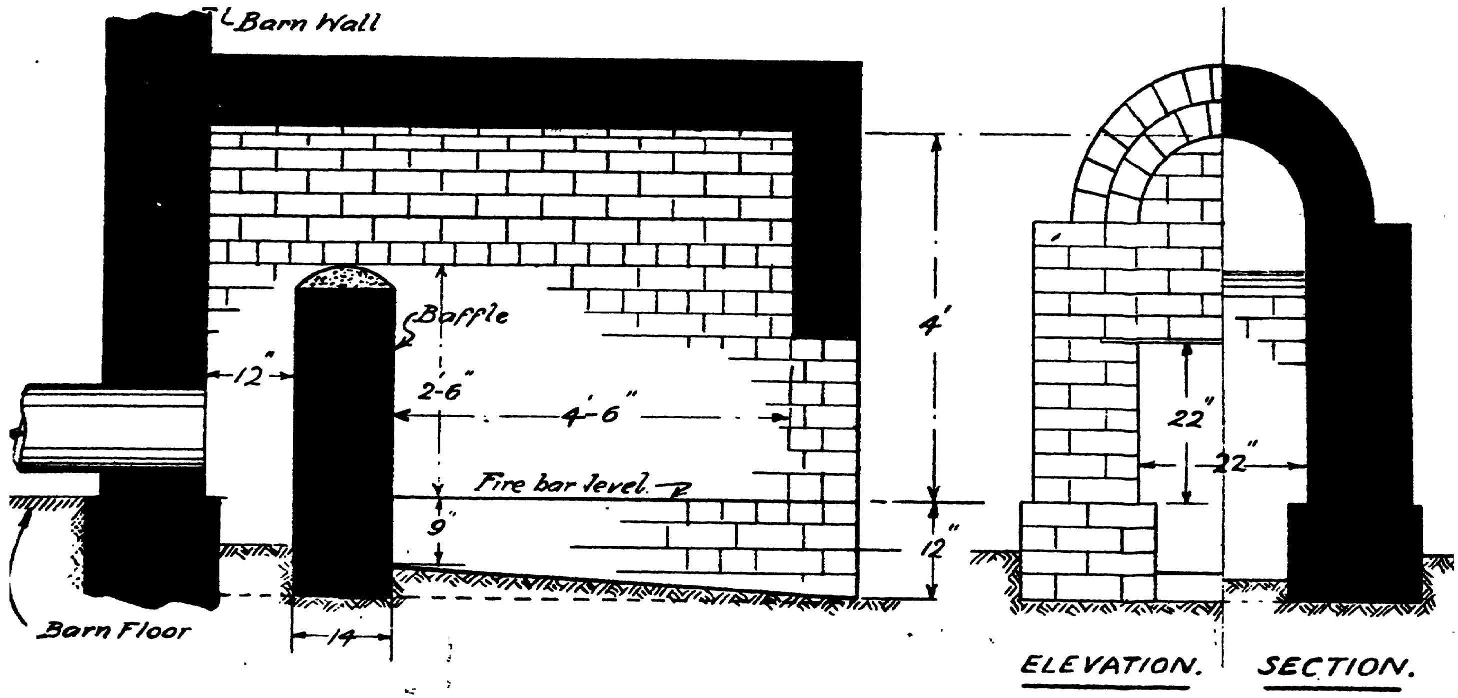
may be more economical to treat a few bales in a smaller room than to fumigate a large barn at full strength. The barn could be treated separately at the smaller dosage. The bales should be stood on end with air spaces between each to expose as much surface as possible.

(For fumigating a shed 100 feet by 16 feet, with 10 feet walls, without bales in it, 12 lbs. of sodium cyanide would be necessary. For fumigating the same building with bales in it, 57 lbs. would be necessary.)

The greatest care should be exercised when carrying out all stages of the fumigation, for inhalation of the fumes of the gas may easily result in loss of life.

ST. O'GORMAN DIP.

On page 78 of the January issue of the Journal St. O'Gorman dip was classed as a 1—200 dilution. This should have read 1—300.



.TOBACCO. BARN. FURNACE.

Improved Tobacco Barn Furnace.

By P. H. Haviland, B.Sc. (Eng.), Assistant Irrigation Engineer.

While on a recent tour of the Umvukwes area my attention was drawn by one of the leading tobacco growers there to an improved type of tobacco barn furnace which had already been installed at one or two farms.

During the period I was in that neighbourhood I had the opportunity of seeing this furnace in operation, and later I was informed that the fuel consumed in curing one barn had been two cords of wood only, thus effecting an appreciable economy, and this without the use of fire-bars.

The drawing on the opposite page shows details of this furnace. The saving is effected by a more complete combustion of the combustible constituents of the fuel. This is carried out in a combustion chamber formed by bricking in the arch of the furnace at the stoking end. The heated gases given off from the fuel are thus prevented from escaping into the atmosphere. A still greater economy may be effected by closing the stoking opening with a metal door, at the bottom of which a metal flap is hung covering the ash pit opening. Control of air to the furnace is accomplished by means of this flap, which may be lifted to permit of the entry of more air, and vice versa. The chief factor to be considered in obtaining most efficient combustion is the quantity of air necessary, and this will naturally vary with the type of fuel being burnt. It will be to the advantage of the tobacco grower to control the quantity of air admitted, and time may be very advantageously spent in observing how the fires are burning. A steady fire is desirable, and smoke is indicative of bad combustion and is a sign of the necessity for extra air.

The drawings show a furnace for use with round metal flues, but no structural change is necessary for use with the corrugated iron flue beyond setting the furnace lower in the ground. The brick filling of the arch rests on a length of second-hand 60-lb. rail, or may be supported by a strip of wagon tyre. It is advisable to make the baffle wall of 14-inch brickwork, as there is a tendency in stoking to push large logs hard up against it with a certain amount of force, which a wall of less thickness would be incapable of resisting without fracture. As it is almost certain that soot and ash will collect behind the baffle wall, it would be advisable to have an opening for cleaning purposes in the wall of the furnace opposite this chamber. Accumulations of soot are to be avoided, as they increase the danger from fire.

A further advantage of this furnace is that if fire-bars are used no cold air is drawn in over the fire, all the air having to pass from the ash pit through the fire.

Conversion of the old type of furnace to this type can be effected at a comparatively small cost, which the economy in fuel consumption more than justifies.

Notes on Flue Curing of Tobacco.

By C. A. Kelsey Harvey, Manager, Tobacco Experiment Station, Salisbury.

No standard temperatures can be given for the process of flue curing, as so much depends on the condition of the leaf when placed in the barn, but it is thought that the following notes on the subject may be of some assistance to inexperienced growers and curers.

It is essential that the barn should be picked and filled in one day with leaf of uniform ripeness.

There are three distinct stages in curing, viz.:—"Yellowing," "Fixing the Colour" and "Drying Out."

Yellowing.—This process usually takes from 24 to 36 hours at increasing temperatures from 90° F. to 110° F. The air in the barn should be kept moist if necessary by the application of wet sacks placed on the flues and water sprinkled on the floor of the barn from time to time. A hygrometer is required to register the degree of moisture in the barn. When temperatures of 90° F. to 100° F. are registered on the dry bulb, the wet bulb of the hygrometer should read about 3° to 4° below. In temperatures from 100° F. to 110° F. the variation on the wet bulb should be 7° F. to 9° F. below that of the dry bulb.

During this process the chlorophyll and starch in the leaf are destroyed and the enzymes present in the leaf become active.

Fixing the Colour.—In the second stage the utmost care must be taken and the ventilation of the barn must be under perfect control. The colour is fixed by removing the moisture from the barn by gradual ventilation, and at the same time

increasing the heat to destroy the oxidising enzymes, thus maintaining the yellow colour obtained by the first process. Temperatures rising from 110° F. to 125° F., and extending over 12 to 20 hours, are generally required.

Drying Out.—The final stage is simple, and consists of raising the temperature slowly 5° an hour up to 165° F., and holding it there until all the mid-ribs of the leaves are dry. The leaf in the barn should be tested at the top near the walls before the fires are finally drawn. Properly dried mid-ribs will break when bent between finger and thumb.

TYPICAL CURINGS FROM THE TOBACCO EXPERIMENT STATION LOG BOOK, 1926.

FULL RIPE, LIGHT TEXTURED LEAF.

Date	Time	Temp. °F.	Remarks
1st day ...	3.0 p.m.	...	Fires started
	5.0 ,,	90	
	12.30 a.m.	95	
	6.0 ,,	95	
2nd day ...	2.15 p.m.	100	
	9.30 ,,	110	Vents ¼ open top and bottom
	1.0 a.m.	115	,, ½ ,, ,,
	4.15 ,,	120	,, full ,, ,,
3rd day ...	6.5 ,,	120	,, ,, ,, ,,
	2.0 p.m.	125	,, ½ closed top and bottom
	7.30 ,,	130	
	12.0 ,,	140	,, all closed
	6.0 a.m.	150	
4th day ...	9.0 ,,	155	
	10.0 ,,	160	
	11.0 ,,	165	
	6.0 p.m.	165	Fires drawn

One day reckoned from sunrise to sunrise (6 a.m. to 6 a.m.).

FULL RIPE, MEDIUM TEXTURED LEAF.

Date	Time	Temp. °F.	Remarks
1st day ...	5.45 p.m.	...	Fires started
	8 0 ,,	90	
	4.0 a.m.	95	
2nd day ...	12.0 p.m.	100	
	5 55 a.m.	110	
3rd day ...	6.30 ,,	115	Vents ⅓ open top and bottom
	2.30 p.m.	120	,, ½ ,, ,,
4th day ...	7.30 a.m.	125	,, full ,, ,,
	12.0 ,,	125	,, ½ closed top and bottom
	4.45 p.m.	130	
	8.0 ,,	135	
	9.0 ,,	140	,, all closed
	10 0 ,,	145	
	11.0 ,,	150	
	12 0 ,,	155	
	1.0 a.m.	160	
	2.0 ,,	165	
	5.0 ,,	165	
5th day ...	9.30 ,,	170	Fires drawn

One day reckoned from sunrise to sunrise (6 a.m. to 6 a.m.).

Hygrometers and thermometers should be placed in the centre of the barn level with the bottom of the first tier of leaves, and projecting sufficiently for the graduations to be read easily.

Bee-Keeping in Rhodesia.

By T. Savory.

Bee-keeping is one of the oldest industries of the world. In the early records of Biblical lore mention is made of a land flowing with milk and honey, and again that "butter and honey shall he eat." In classical history Aristotle wrote about bees, and in Virgil's works almost the whole of his fourth "Georgics" is devoted to the life history of the honey bee. In more modern times it is well known that the industry has been roughly cultivated throughout the world in straw skeps, etc., especially amongst the farming and peasantry classes of England.

It is, however, only within the last 60 years that the industry has really moved ahead, dating in fact from the year 1852, when the Rev. L. Langsbroth first invented the movable frame which revolutionised bee-keeping throughout the world. From that day it has never looked back. In the U.S.A. alone statistics show that 75 million dollars' worth of honey and three million dollars' worth of beeswax were produced there in the year 1923. Turning to our own country of Africa, the *S.A.B.K. Journal* states that honey to the value of £2,000,000 is lost annually to the Union alone; while as to our own Rhodesias, south and north, where, as far as we know, there are no available statistics to turn to, it seems safe to estimate that a large output of honey only awaits the knowledge and work of those who may elect to take up the industry in careful and up-to-date means. The bush and the veld abound with wonderfully rich nectar-bearing trees, shrubs, creepers, plants and flowers of all kinds, while the main honey bee can compare with any other in its breeding powers, its ability to store honey and its general resistance to sickness.

The recent articles which have appeared in this Journal have been written with the object of encouraging the

keeping of bees. We will presume that the beginner has made a start this summer with two or three hives, and intends increasing these next season to 10, 15 or 20 colonies. It is now proposed to amplify what has been written with a view to enabling the novitiate to enter upon the 1927 season with a reasonable chance of making bee-keeping pay as a side-line. Let it be said at once that all apiary work must be carried out in the same thorough way as any other side-line should be.

The prepotency of the queen bee is in its degree just as important as it is in the pedigree bull of the herd. From her each hive will probably have its own outstanding feature of fertility, docility or fierceness, traits of working powers, laziness or sulkiness, cleanliness of work or the reverse.

The Rhodesian honey bee (Apis mellifica) is to be found in its wild state in holes in trees, in the ground and in rocks or krantzes; but of the three varieties, the only one the apiarist is advised to handle and cultivate is the first, i.e., the one which usually has a hollow tree or tree hole for its nest. As a rule it is a first rate honey-getter, and though slightly smaller than the English or American bee, it can easily vie with either in the production of honey upon due cultivation and in proper hives. The one having its nest in the ground is as a rule not worth handling; it seems a distinct variety and of a much smaller community. The rock or krantz bee should never be hived, for it is fierce, extremely vicious and really dangerous. One such colony in an apiary might easily cause much trouble with others and be an unceasing torment to the owner.

If the season now closing has been passed without the possession of any standard work, it is strongly advised not to go through the next one without at least one book of reference. Root's "A B C and X Y Z of Bee-Keeping," price 12s., is an invaluable work, touching upon every conceivable point in American work with bees; while Mr. T. A. Attridge's book, "Bee-Keeping in South Africa," 3s. 6d., solves many local questions and should be owned by all interested. It is also advisable to subscribe to at least one bee journal, say, the S.A.B.K. Association, the English one or an American one. By doing so the apiarist is kept up to date with all matters in connection with the work.

It is proposed to treat our subject somewhat upon the following lines and rotation, viz.:—

1. The choice and formation of an apiary.
2. The discussion of a standard Rhodesian hive; all parts interchangeable.
3. The preparation for obtaining and handling the swarms necessary for the formation of the apiary.
4. The obtaining of swarms and the proper hiving and handling of same, with feeding notes.
5. The general question of the various honey flows of the season and districts, with as much detail as may be available of the flora, viewed in relation to its nectar products.
6. The reduction of swarming, and maintenance at full strength of all hives.
7. The management and rearing of queens.
8. The extraction of comb honey, ripening, straining, bottling and marketing.
9. Closing down for the winter, contracting and warming hives, and the general care of the apiary during those months.

The Choice and Formation of the Apiary.—Unless space is strictly limited, as might be the case on a town site, it is as well to allow plenty of room, and, where possible, it should be located where there is natural shade, although this is not essential. In no case should the apiary be near the dwelling house or any building or kraal in which stock is kept. Bees are by nature gentle and docile, and only get offensive when disturbed; but with stock or natives close by, accidents may occur, and the best policy is to run no risk in this way. My own apiary is at least 500 yards from any dwelling, and except for one large thorn tree, was at first wholly without shade. To-day the tree or hedge of trees (Cassia marylandica) offers each hive all the shade and protection from pirates that it requires. If possible, level ground should be selected, otherwise the surface of each hive stand must be on a level area. The aspect should, of course, be the rising sun, east or north-east (the wild bee almost invariably has its tree-hole nest at this aspect).

As, however, in this country much of our winds come from this quarter, each aspect must be treated accordingly or breakwinds provided, as hives should not be moved when once they have been placed in position. The direction of prevailing rains should also be considered; they should, if possible, strike the hives from the back. Be sure to select your site away from any direct line of cattle paths or any road that may be regularly used for farm purposes. Bees like a clear line of flight, and, knowing this, it would be bad policy to court possible trouble by work close by. An ideal spot would be an orchard of young trees, fenced from straying animals.

So much for the choice; now for the formation of the apiary, upon which will depend to a considerable degree the success of the undertaking. The first item to decide is the number of hives you are providing for and the spacing apart of them. Authorities differ as to hive spaces, and I agree with many that this also should be decided according to the circumstances. In England or America, where one is dealing with the cultivated bee, two hives can be almost touching each other if one is painted white and one khaki or other shade, for bees can quickly distinguish colours, though they might not know right from left when hives are close together. Experience with the wild Rhodesian bee tends to prove that a bigger distance is much preferable, and that two hives on one stand 20 inches deep by 4 feet 6 inches long is better spacing, leaving as it would a space of 1 foot 10 inches between the two; and this is also a comfortable distance to work with them. From stand to stand is again debatable; some say 5 feet, others 6, 8 or 10 feet apart. I consider an 8-foot clearance is a good workable distance both for the bees and the owner. Working, therefore, upon these figures, a space of 8 yards by 20 yards should allow ample room for the 20 hives, the aspect and spacing of which might be arranged to provide for a clear working space between the back of the hive stand and fencing of 3 feet on all four sides.

Having decided upon the site and capacity of the apiary, the final item to consider is the formation. In England, America and the Colonies simple precautions only are required, and it is often located quite in the open. In

Rhodesia, however, sooner or later the ratel or honey badger will find the hives, when, if not guarded against, they will be found upset on the ground and most of the inmates eaten, and "finis" written to the attempt at bee-keeping. Then the wily native is a great lover of honey and will take risks to steal it. Further, an upset of the hives by stock will probably cause the death of sheep, goats, pigs, calves or larger animals in the vicinity. Any apiary, therefore, however small, should be fenced, and a short description of mine may act as a guide. On all four sides a trench is dug about 18 inches deep by 6 inches wide, into which flat river stones are put and the earth rammed down again; if stones are not handy, half the width of a three-foot pig wire netting will do as well. An outside fence of ordinary two-inch mesh six-foot fowl netting is then put on all four sides, with poles every five or six feet apart; and when a secure padlocked door wide enough for a wheel-barrow to pass through is fixed, the apiary will be ready to be occupied as occasion requires. The care of it requires a few words only. Always keep it free from grass and weeds, and especially so underneath and near each hive stand; even one large blade of grass touching any portion of the hive or stand above the tins of water the legs are in is quite enough for a quantity of ants to gain access, and these are probably the greatest pests that bees have. Grass, weeds, etc., also harbour mice, lizards, frogs, snakes and many insects that should not be near the hives. A good plan is to scatter common salt under and close to each stand or to pave the yard with flat stones or whole or half bricks. A half paraffin tin of clean and fresh water, in which a pinch of salt has been put, will complete the apiary and make it ready to place your hives in it accordingly. Make sure that all hive stands are level; bees are most careful builders, and will not work their combs except on a dead level, so that any failure on this point will only lead to trouble later on when occasion requires the transference of such combs or frames to other hives.

The Second Maize Export and Grading Conference.

This conference was held in the offices of the Department of Agriculture on the 18th November, 1926. The following gentlemen, representing the farmers and exporters' interests, were present:—Messrs. J. Pascoe, J. Buckmaster, D. Black, E. W. L. Noaks, H. B. Christian, T. Mossop, R. W. Wilson (B. & M. & R. Railways), W. Rogers, N. St. Quintin, H. Garmany and representatives of the Department of Agriculture.

The chair was taken by the Chief Agriculturist, who opened the conference with a review of the resolutions arrived at by the first conference, held in March of last year, and of the steps taken, and still being taken, to give effect to those resolutions.

The matters discussed and the recommendations made by the conference were briefly as follows:—

(1) Moisture Content of Maize Exported Overland to Points in Africa Outside this Territory.—It was unanimously decided to recommend the Government to consider the raising of the moisture content of maize to be exported overland to other parts of Africa to 13.5 per cent., instead of adhering to a maximum of 12.5 per cent.

(2) The Necessity for Permanent Graders.—Mr. Buckmaster, with the support of the other delegates, pressed strongly for an increased staff of permanent graders, and it was agreed to recommend the Government to retain a staff of not less than four permanent graders. It was suggested that the services of these officers, when not employed on grading duties, should be utilised in other ways to further the advancement of the maize industry.

(3) Testing for Moisture Content of Maize.—It was explained by the chairman that the acceleration anticipated in this service by the use of three new portable testers had

not been forthcoming until late in the season, owing to certain parts of the apparatus which were essential to their portability not being received. The apparatus are now complete.

(4) Graders' Reports.—At the instance of Mr. Buckmaster and other delegates it was recommended that graders should be instructed in future to write on the back of the receipts for grade certificates the reasons for the relegation of any bags of maize in a consignment to low grades or for their rejection.

(5) "Seed" versus Grade No. 1 Maize.—This subject arose out of proposals that the designation "Seed" should be substituted for Grade No. 1. After discussion it was agreed that the matter be left, pending further enquiries by the Maize Association and the Department of Agriculture.

(6) "Weevilly" Maize.—A delegate stated that he considered the maize industry was suffering a considerable monetary loss owing to the too sweeping nature of the terms "slightly weevilly" and "weevilly," used to designate the condition of maize injured by weevil. He considered that additional terms should be adopted which would indicate more clearly the exact degree of injury by weevil. The conference supported these views, and it was recommended that further enquiries into this matter should be made.

(7) The Weighing of Maize at the Time of or after Loading.—This question was again raised by representative exporters, and it was generally agreed that exporters were suffering considerable loss owing to the shortage in weight of grain in the sacks. It was finally recommended that the Government should be asked to give this matter its attention.

(8) Statistics of the Maize Industry.—The question of the importance of earlier and more complete estimates of the maize crop of the country to all concerned in the industry was raised. It was agreed that more accurate figures concerning local consumption and annual native production of maize were urgently needed to assist in the estimation of the probable amount of maize available.

The necessity for the accurate and punctual supply of figures by farmers of the amount of maize retained by them for their own use on the farm was emphasised, as also the

necessity for the prompt sending in of these returns of production.

It was subsequently suggested that the Government should require all traders purchasing maize from natives to submit to the Department of Agriculture monthly returns showing the amounts of maize thus purchased by them.

The Maize-Growing Competition.

The following list of competitors, together with the number of plots entered, has been handed to us by the Maize Association for publication:—

	No. of plots.
Banket—	
Colborne, S. A. S.	1
Dodd, W. H.	1
Bindura—	
Corser, H. D.	2
Farmer, J. H.	1
Freestone, W.	1
Glen, C. J.	1
McCarthy & Co.	1
Mills, A. C.	1
Moorcroft, A. E.	2
Rattray, G.	2
Riley, D.	1
Bromley—	
Haslam, Lt.-Col. L. C.	1
Concession (Mazoe)—	
Fynn, V. W.	1
Southey, F.	1
Eastern, Fort Victoria—	
Brunette, G. D.	1
Jackson, E. G.	1
Rademeyer, J.	1
Richards, W. B.	1
Richards, N.	1

	No. of plots.
Enterprise—	
Christian, H. B.	3
Forbes, D. C.	3
Harvie, J. U.	2
Johnstone, J.	2
Peacocke, U. N.	3
Richardson, Johnstone	2
Ross, Jas.	2
Staunton, A. G.	2
Essexvale—	
Cooper, Gordon	1
Stowe, H. O.	1
Gadzema—	
Alexander, A.	1
Gatooma—	
Bates, W. L.	1
Dell, H. H.	1
Eddowes, H. M.	1
Green, F. A. E.	3
Rhodes, J. G.	2
Sutherland, R.	1
Woodforde, G. C.	1

	No. of plots.
Glendale—	
Davis, N. B.	1
Davis, S. C.	1
Hanly, J.	2
Mazoe Citrus Estate	3
Mossop, T. J.	3
Mossop, R. T.	1
Schafer, A. W.	3
Watson, W. H.	1
Webb, F.	1
White, E. S.	2
Noaks, L.	2
Hunter's Road—	
Hurrell, D. D.	2
Soutter, W. G.	3
Headlands—	
Austin, A. A.	1
Inyazura—	
Macdonald Bros.	1
Makwiro—	
Downes, Marjorie	1
Rimmer, F. R.	2
Sole, W.	1
Marandellas—	
Bisset, H.	1
Elliott, C. N.	1
Croudace, D. J.	2
Denham, R. S.	1
Duncan, J. G.	2
Hammond, F.	3
Hodgson, C. W.	2
Spicer, W. N.	3
Stevens, A. F.	2
Thornhill Bros.	2
Worswick, C. W.	2
Marandellas South—	
Hughes, P. A.	1
McLachlan, D. S.	1
Ruston Bros.	1
Scorror, H. K.	1
Brown & Ramsay	2
Fleming, J. F.	1

	No. of plots.
Mashonaland—	
Dunlop, Mrs. L. C.	1
Blackwell, W. R.	1
Dennis, J.	1
Gresson, P. H.	2
Hards, C. G.	1
Hards, H. C.	2
Huggins, G. M.	3
Meade, Major W. L.	1
South, E. H.	3
Syfret, G. R.	2
Wilson, Mrs. M.	3
Wheeler Bros.	2
Norton and Lydiate—	
T. Fletcher & Co.	3
Nyamandhlovu—	
Green, L. & C.	1
Sharp, R. R.	1
Poorti Valley—	
Ludgater, W. A.	1
Thompson, J. N.	1
Salisbury South—	
Fleming, G. N.	2
Linton, P.	2
Shamva—	
Bean, D. W.	3
Graham Bros.	2
Morkel, A. R. S.	3
Townshend, R. L.	2
Two Rivers—	
Green, S. H.	2
Midlands—	
Davidson, N. W.	1
Hurrell, W.	2
Mocke, E.	3
Reed, W. H.	1
Worthington, S. B.	1
Total Number of Plots	166

Dipping Tanks.

The following note has been handed to us by the Chief Veterinary Surgeon for publication:—

During the rainy season many farmers experience great difficulty in keeping the tank solution up to strength because of the rain falling directly into the tank and flooding from the draining pens. The latter frequently results in a considerable wastage of dip, especially where the overflow has to be emptied by buckets, in which process the entire contents of the tank become mixed, thus causing a great loss of the arsenical solution. The simplest method of preventing flooding is, of course, by the provision of proper drains; but drains are sometimes forgotten, or the outlet pipe becomes blocked and flooding results. To minimise the mixing of flood water with the tank fluid and the resulting loss of dip, and to save labour in baling out flooded tanks, Cattle Inspector H. G. Morris suggests that a run-off pipe be inserted through the wall of the tank an inch or two above the normal level of the tank fluid. During dipping operations the pipe should be plugged up, but at other times it should be left open so as to allow superfluous liquid to escape as soon as possible.

Movements of New Settlers.

New Arrivals.—The following new settlers arrived in the Colony during the month of December, 1926:—

L. Smith and C. H. Williamson.—Arrived from England on 3rd December, 1926, and proceeded for a period of training to Mr. H. K. Bracewell, Ruia Farm, Concession.

J. C. R. Young.—Arrived from England on 3rd December, 1926, and is now undergoing training with Mr. A. Peck, Chatsworth.

R. C. D. Combe.—Arrived from England on 3rd December, 1926, and is now on Mr. E. A. B. Prior's farm Mgadzi, Darwin.

J. P. S. Petit.—Arrived from England on 3rd December, 1926, and joined Mr. W. M. Clatworthy, Concession.

Mr. and Mrs. F. Warburton.—Arrived from England on 7th December, 1926, and have been accommodated on the Gwebi Government Farm.

W. Fardell.—Arrived from England on 7th December, 1926, and joined Mr. E. Ainslie on Birkdale, Banket.

Messrs. Noble Bros.—Arrived from Australia on 7th December, 1926, and are viewing land in various districts.

A. P. W. Seely.—Arrived from England on 8th December, 1926, and proceeded to the Sherwood Block under the London and Rhodesian Mining and Land Company.

A. M. E. Menko.—Arrived from England on 10th December, 1926, and proceeded for a period of training to Mr. W. P. Chappell, Haighton, Banket.

F. C. D. de Labilliere.—Arrived from England on 10th December, 1926, and is now with Mr. C. W. Worswick on Somerset, Marandellas.

H. F. Golding.—Arrived from England on 10th December, 1926, and is now receiving training on the Gatooma Cotton Growers' Association farm, west of Gatooma, Hartley district.

Mr. and Mrs. T. R. Colan.—Arrived from England on 13th December, 1926, and have been accommodated on the Urmston Tobacco Estate, Headlands.

Captain and Mrs. Beaufort.—Arrived from Australia on 16th December, 1926, and are viewing land in various districts.

T. O. Meadows.—Arrived from England on 17th December, 1926, and is now with Mr. J. Templeton on Glenluce, Banket.

J. H. E. G. Ferguson.—Arrived from England on 17th December, 1926, and proceeded for training to Mr. D. Campbell Dunlop, Norton.

R. Bradley-Moore.—Arrived from England on 17th December, 1926, and joined Mr. J. Fleming on Collace, Marandellas.

W. J. V. Redwood.—Arrived from England on 17th December, 1926, and is now undergoing training with Mr. E. J. Dawson, Pembi, Concession.

E. C. Studdart-Holmes.—Arrived from England on 21st December, 1926, and is now undergoing training with Mr. H. J. S. Philp on Horta, Concession.

Captain and Mrs. Payne.—Arrived in the Colony on 21st December, 1926, and have been accommodated with Mr. A. R. Lilford, Lilfordia, Nyabira.

Mr. and Mrs. Rowecliffe.—Arrived from England on 22nd December, 1926, and joined Mr. W. Mells on Marshlands, Norton.

J. S. Hutchinson and F. T. Herring.—Arrived from England on 24th December, 1926, and proceeded for training to the Kent Estate, Norton, under Mr. H. W. Irwin.

S. H. Rylett.—Arrived from England on 24th December, 1926, and is now undergoing training with Mr. P. Hughes on Lynton, Marandellas.

O. Camors.—Arrived from England on 24th December, 1926, and is now with Mrs. Wilson, Porta, Norton.

A. G. May.—Arrived from England on 27th December, 1926, and joined Mr. J. Cahill, Edinboro, Marandellas.

H. Cooke.—Arrived from England on 28th December, 1926, and proceeded to Messrs. Jenkin Bros., Nyadgori, Norton.

W. B. Kilvington.—Arrived from England on 31st December, 1926, and has been accommodated with Mr. T. Gordon Kay, Chelmer, Bulawayo.

C. G. Bastow.—Arrived from England on 31st December, 1926, and proceeded for training to Mr. L. J. Mossop, Glendale.

H. V. de Pree.—Arrived from England on 31st December, 1926, and joined Mr. O. C. Rawson, Darwendale.

Mr. Berrett.—Arrived from Kenya on 31st December, 1926, and is now viewing land.

Settlers who have taken up Land.—Mr. and Mrs. R. A. Comyn.—Have acquired a Crown land farm in the reverted Gabaza Reserve, Hartley district.

Captain H. P. D. Dimmock.—Has acquired a Crown land farm near Fort Victoria.

T. F. Lyle.—Has acquired a Crown land farm near Banket Junction.

Settlers who have left the Colony.—J. V. Nolan.—Left for England on 23rd December, 1926.

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,

Rhodesia Agricultural Journal.

Sir,

Bee-Keeping in Rhodesia.

Replying to Mr. Moubray's query in your December issue regarding bee bird pests, my opinion is that, though they prevent the bees feeding as they should, owing to their being frightened to go outside the hive when the birds are much about, the general feeding hours are wholly regulated by the various times of the honey flows, which may be, and generally are, very variable. In Root's "A B C of Bee Culture" it is written, "The secretion of nectar is often, if not always, correlated with the character of the soil, the temperature and water supply." A heavy thunderstorm, followed by a quick fall in temperature, may bring a successful honey flow to a premature end; heavy rains may lessen and light rains may stimulate largely the quantity of nectar secreted by a honey plant. I have noticed that the "Mimoseæ" or thorn trees, and the native "Si-gelie," all large nectar-bearing trees, produce it only in early mornings and late afternoons; and so with many of our bush trees. The Grys apple, a prolific producer, is at its best at sunrise. Mr. Moubray is only one of several whose activities have been terminated by the ratel or honey badger, for which I know only one remedy—a sunken fence of flat stones or pig wire fencing (see December notes). Personally, I have been very fortunate in escaping the birds and wasps pests, and put it down mainly to the style of hive entrances and position of stands. The alighting board is some two inches deep, and this, being mostly covered by the porch sloping from the front of the hive, gives the bees a much greater sense of security; and as the stands are close up

to a hive frontage, neither birds nor wasps have much chance of getting the bees, except when upon the wing. Pollen, of course, is obtainable at all hours of the day as long as plants bearing the same are in flower, so that for this purpose bees are flying practically all hours of daylight, though it is generally accepted that they make their collecting trips for this article more frequently in the morning than other parts of the day.

I am, etc.,

T. SAVORY.

The Editor,

The Rhodesia Agricultural Journal.

Sir,

Dams for Watering Stock.

I shall be obliged if you or any of your correspondents can give some information as to the use of dams for watering stock, particularly cattle. The type of dam in question is the usual earthwork construction put in across a vlei to conserve storm water and into which cattle walk daily to drink; also, through evaporation and watering of stock, they are usually very low at the end of the dry season, and in some cases dried up.

Such dams are very common in South Africa, but I have been informed that their use as indicated above is very detrimental to stock, and I shall be very pleased to have some definite information on the following lines:—

Will dams used under such conditions be harmful to cattle, and if so, to what extent, as regards "wire worms," "fluke," or any other source of trouble?

If wild water fowl and fish breed freely in dams, will they have any beneficial effect in holding water pests in check?

In the case of comparatively small dams, is there any chemical or other remedy which can be economically used to prevent breeding of "wire worm," etc.?

Generally, in instances where such dams are the only

source of water supply, what is considered the best method other than fencing them and drawing water supply through a pipe from the dam so that cattle can be kept in first-class condition?

I am, etc.,

"RANCHER."

Review.

Through the courtesy of the University of California Press we have received a copy of "Plant Nutrition and Crop Production," by Sir John Russell, Director of the Rothamsted Experimental Station, Harpenden, Hertfordshire, England.

At the University of California in 1909 was established through the generosity of a Mr. Charles H. Hitchcock, of San Francisco, what is known as the Hitchcock Lectureship, for the purpose of giving the public the benefit of lectures on "popular and scientific subjects."

Since its inception the Hitchcock Foundation has provided series of lectures by many eminent scientists, but in 1924 the appointment of Sir John Russell to the lectureship signalised the first occasion on which agricultural science was made the lecturer's field.

"Plant Nutrition and Crop Production" consists of the lectures thus given by Sir John Russell, and is divided into five chapters, entitled the Study of Plant Nutrients, Positive Science and Exact Demonstration, Decay and the Living

Plant, the Soil Micro-organisms: Can they be Controlled and Utilised? and the Soil and the Living Plant.

Sir John Russell's writings are already familiar to all agricultural scientists, and the research work carried out at Rothamsted under his direction is annually adding knowledge of incalculable value both to those engaged in research in all parts of the world and to the practical farmer.

This latest contribution from his pen bears the hallmark of all Sir John Russell's writings. The language used is of the simplest; deductions are expressed in a manner most easy to follow, and the lectures as a whole are woven into a narrative of absorbing interest, in which the reader is taken step by step through the more important scientific crop and soil investigations of recent years. The gradually accumulated knowledge of investigators in different countries and the manner in which these discoveries are constantly pointing the way to other essential research into science as applied to agriculture are not only highly educative, but also intensely interesting. "Plant Nutrition and Crop Production" should find a place on the book-shelf of every research worker in these subjects, and should be read by all those responsible for providing the funds wherewith such work is carried on.

H. G. M.

Southern Rhodesia Weather Bureau.

DECEMBER, 1926.

Pressure.—During the month the mean barometric pressure was below normal, varying from 0.064 in. below normal at Livingstone to 0.004 in. above normal at Umtali. The extreme fluctuations of pressure during the month varied from 0.20 in. at Livingstone to 0.17 in. at Fort Victoria and Salisbury. There were four low pressure systems which affected this country. A northerly low appeared at Kenhardt on the 2nd, intensified off the south coast on the 3rd, and appeared with little intensity off Beira on the 5th and 6th, and then moved north. A minor low was in evidence west of Livingstone on the 4th, 5th and 6th; on the 7th this appeared at Kenhardt, having deepened considerably. On the 8th a low of similar intensity appeared off the south-east coast, and was off Beira on the 10th and 11th with fair intensity, and then passed off. A northerly low was in evidence west of Livingstone on the 9th and 10th, and appeared at Kenhardt on the 11th, intensified off the east coast on the 12th, and appeared moderately deep off Beira on the 13th and 14th. A northerly low showed in the west on the 12th and 13th, passed to the south and east, and after irregular movement was off Beira on the 18th and 19th. A northerly low was in evidence to the west on the 15th, 16th and 17th, intensified on the 18th and 19th, but passed off to the south and east. Minor lows only were in evidence for the rest of the month. A minor high was present in the south of Rhodesia on the 1st. On the 15th pressure in the south rose to normal and remained comparatively high for the rest of the month. Minor highs were in evidence at Mazunga on the 15th, 20th, 24th, 25th, 26th, 27th and 30th.

Temperature.—During the month the mean temperature was about normal, varying from 2.5° F. above normal at Gwelo to 3.6° F. below normal at Mount Selinda. The mean day temperatures were below normal, varying from 5.6° F. below normal at Mount Selinda to 3.8° F. above normal at Matopos Estate. The mean night temperatures were above normal, varying from 3.0° F. above normal at Hartley to 2.8° F. below normal at Shamva Mine. Humidity was generally above normal, varying from 17 per cent. above normal at Shamva to 7 per cent. below normal at Fort Victoria.

Rainfall.—The mean rainfall over the country amounted to 6.10 ins., as compared with a normal of 5.51 ins. The seasonal total amounts to 8.65 ins., as compared with a normal of 10.17 ins. The mean rainfall as recorded in the various zones is as follows:—

	Dec., 1926 Inches.	Normal, Dec. Inches.
Zone A (western Matabeleland)	6.01	5.52
Zone B (south-eastern Matabeleland) ...	2.58	4.27
Zone C (western Mashonaland)	7.85	5.79
Zone D (north-eastern Mashonaland) ...	9.11	6.51
Zone E (south-eastern Mashonaland)	6.12	5.79
Zone F (eastern border)	8.37	7.98

From the above it will be noted that Zone B alone was below normal.

In Zone A the district with the greatest mean rainfall was Sebungwe, with 8.44 ins.; and the district with the least was Insiza, with 3.69 ins.

In Zone B the district with the greatest mean rainfall was Bulalima-Mangwe, with 5.03 ins.; and the district with the least was Chibi, with 0.35 in.

In Zone C the district with the greatest mean rainfall was Hartley, with 9.33 ins.; and the district with the least was Gwelo, with 5.63 ins.

In Zone D the district with the greatest mean rainfall was Mtoko, with 9.48 ins.; and the district with the least was Mazoe, with 6.51 ins.

In Zone E the district with the greatest mean rainfall was Charter, with 8.54 ins.; and the district with the least mean rainfall was Chibi, with 1.88 ins.

In Zone F Melsetter had 8.37 ins.

Rain Periods.—On the 1st showers were reported round Salisbury and Sinoia; 2nd and 3rd, west Matabeleland. On the 4th to 14th showers and rain were fairly general. From 15th to 19th the weather cleared in the south, rain being confined first to Mashonaland and later to north-eastern Mashonaland only. No rain was reported on the 20th, and from the 21st to 31st rain was mainly confined to north and north-eastern Mashonaland and the eastern border.

RAINFALL.

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	1.11	3.83	6.37	9.37
Imbesu Kraal ...	...	...	...	9.78
Inyati ...	1.28	4.65	6.32	10.03
Judsonia ...	1.30	3.99	6.06	n.s.
Martha Farm ...	1.54	3.31	6.24	n.s.
Shangani Estate ...	2.59	4.37	7.13	9.24
Bulalima Mangwe—				
Centenary ...	1.69	3.93	6.26	n.s.
Kalaka ...	1.37	3.65	6.53	9.17
Riverbank ...	1.03	6.77	8.34	9.39
Solusi Mission ...	.99	2.82	4.69	9.78
Bulawayo—				
Fairview Farm ...	1.55	4.63	6.99	8.96
Keendale ...	2.00	2.15	4.43	8.82
Lower Rangemore ...	1.42	3.98	6.55	9.54
Observatory ...	1.25	4.86	6.51	9.77
Gwelo—				
Dawn ...	nil	5.61	5.61	9.07
Delano Estate ...	.89	...	...	n.s.
Gwelo Gaol ...	.72	8.34	11.03	10.68
Riversdale Estate ...	nil	5.19	7.95	n.s.
Somerset Estate ...	.82	6.57	7.95	10.21
Insiza—				
Orangedale ...	2.14	2.98	5.37	11.33
Shangani ...	1.30	4.70	6.05	9.44
Thornville ...	2.37	3.39	5.90	10.07
Nyamandhlovu—				
Edwaleni ...	.47	4.80	5.27	9.43
Gwaai Reserve ...	.75	...	...	n.s.
Impondeni ...	1.19	7.28	8.70	n.s.
Naseby ...	2.57	3.20	6.21	8.96
Nyamandhlovu Railway ...	.46	4.70	5.16	9.17
Sebungwe—				
Gokwe ...	2.06	8.44	11.69	11.50
Umzingwane—				
Springs ...	1.77	4.77	6.87	9.85
Wankie—				
Matetsi Railway ...	2.70	7.80	11.37	12.04
Ngamo Railway ...	1.31	6.08	7.91	11.65
Sukumi ...	1.04	5.45	8.30	n.s.
Victoria Falls ...	2.75	5.61	8.66	11.28
Wankie Hospital ...	1.35	3.31	6.94	9.27
Waterford ...	3.04	...	...	...
Zone B.:				
Belingwe—				
Bickwell ...	.65	4.25	5.26	9.30
Bulalima-Mangwe—				
Bruwapeg ...	3.03	1.47	5.14	n.s.
Edwinton ...	1.63	3.92	6.20	8.68

RAINFALL—*(Continued)*.

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	2.28	...	...	8.42
Garth ...	2.22	5.96	10.15	9.93
Maholi ...	2.05	4.87	7.88	9.30
Retreat ...	...	4.46	...	8.51
Sandown ...	.91	4.43	5.77	n.s.
Semokwe Reserve ...	3.73	2.83	6.79	n.s.
Tjankwa ...	2.70	7.88	11.13	9.52
Tjompanie ...	1.60	9.44	12.28	9.09
Chibi—				
Nuanetsi Homestead ...	.73	.35	1.38	6.23
Gwanda—				
Antelope Mine ...	2.60	1.87	6.04	7.89
Gwanda Gaol ...	1.06	1.83	3.80	8.24
Limpopo ...	2.29	.22	3.74	n.s.
Mazunga ...	1.77	...	...	6.44
Tuli ...	1.89	1.93	5.24	5.59
Insiza—				
Albany ...	1.85	3.92	5.98	8.80
Filabusi ...	1.06	3.10	4.23	8.42
Fort Rixon ...	1.10	5.70	6.87	8.79
Inyezi	.63	3.74	4.44	8.60
Lancaster ...	1.70	2.11	4.01	n.s.
Wanezi Mission ...	.79	2.03	2.82	n.s.
Matobo—				
Bon Accord ...	1.12	2.08	3.91	n.s.
Fort Usher ...	.92	6.83	9.89	n.s.
Holly's Hope ...	2.41	1.94	6.45	8.50
Longsdale ...	1.56	5.28	7.21	n.s.
Matopo Mission ...	.91	8.61	9.52	10.38
Matopo School ...	...	5.95	...	n.s.
Mtshabezi Mission ...	.45	1.38	3.08	8.73
Rhodes Matopo Park ...	1.11	6.31	8.09	9.38
Wenlock Ranch ...	1.34	1.38	4.59	n.s.
Umzingwane—				
Balla Balla ...	.78	3.17	4.14	9.44
Essexvale ...	1.74	3.72	7.15	9.20
Heany Junction ...	1.90	4.15	10.22	10.24
Hope Fountain ...	...	...	...	10.03
Zone C.:				
Charter—				
Bushy Park ...	1.78	6.55	8.53	11.01
Enkeldoorn ...	1.68	5.38	7.14	11.11
Marshbrook ...	3.08	8.87	12.13	10.70
The Range ...	3.00	7.49	10.69	11.49
Vrede ...	...	...	...	10.73
Chilimanzi—				
Beacon Hill ...	1.40	7.08	8.86	n.s.
Central Estates ...	1.34	8.39	10.36	11.26

RAINFALL—(*Continued*).

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Chilimanzi (continued)—				
Fourie's Post ...	...	6.78	...	n.s.
Orton's Drift ...	1.42	6.78	8.36	11.26
Sebakwe Post ...	2.33	7.47	9.90	n.s.
Umvuma Railway ...	1.59	5.93	7.52	11.39
Gwelo—				
Cross Roads ...	1.10	4.67	6.20	9.93
East Clare Ranch ...	.95	8.09	9.11	n.s.
Globe and Phœnix Mine ...	1.12	6.13	7.63	10.29
Indiva ...	1.49	4.48	5.97	n.s.
Iron Mine Hill ...	2.29	6.88	10.99	n.s.
Lyndene ...	1.53	4.83	7.07	n.s.
Lannes Farm ...	1.39	5.12	7.19	n.s.
Rhodesdale Ranch ...	1.56	4.64	8.05	10.14
Woodendhove ...	3.09	6.83	11.12	10.76
Hartley—				
Ardgowan ...	1.50	9.56	11.29	11.61
Balwearie ...	.56	10.00	10.94	n.s.
Battlefields ...	1.08	11.16	12.24	10.56
Beatrice ...	2.73	7.81	11.35	11.99
Carnock ...	3.44	9.42	12.92	11.61
Cromdale ...	2.26	10.88	13.19	n.s
Deweras Store ...	1.47	10.22	12.03	n.s.
Eiffel Blue Mine ...	1.06	8.00	9.16	n.s.
Elvington ...	1.58	8.07	9.69	11.45
Gatooma ...	1.78	10.54	12.37	11.72
Gatooma Experiment Station	.80	10.85	11.99	n.s.
Gowerlands ...	2.85	8.21	12.40	11.00
Handley Cross ...	1.23	10.92	12.58	n.s.
Hartley Gaol ...	.80	8.62	9.76	11.41
Hopewell ...	1.75	10.16	11.91	11.77
Jenkinstown ...	2.93	9.18	12.20	11.47
Maida Vale ...	.28	13.79	14.07	n.s.
Nyadgori ...	1.99	7 59	9.58	n.s.
Palham ...	3.07	7.70	10.78	12.18
Ranwick ...	.75	8.81	9.56	11.37
Rocky Spruit ...	2.70	9.90	13.00	n.s.
Thornby ...	...	...	...	10.85
Thorndyke ...	1.14	4.33	5.97	n.s.
Lomagundi—				
Argyle ...	.89	8.59	9 93	10.75
Baguta ...	.06	11.19	11.41	11.03
Between Rivers ...	1.45	10.72	10.86	n.s.
Tsanunu ...	...	7.78	...	n.s.
Citrus Estate ...	.78	11.24	12.58	10.43
Darwendale ...	...	...	...	10.83
Debera ...	3.74	9 89	14.13	n.s.
Devonia ...	1.44	8.62	10.62	10.59
Dingley Dell ...	.12	7.31	7.43	n.s.
Elinda ...	...	...	...	n.s.
Gambuli ...	1.11	7.41	9.30	11.75

RAINFALL—(*Continued*).

STATION.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi (continued)—				
Msina ...	.63	9.98	...	n.s.
Impingi ...	...	10 55	12.18	n.s.
Kapiri ...	3.58	9.92	13.50	n.s.
Lone Cow Estate ...	2.56	10.35	12.92	11.10
Mafoota ...	.38	9.97	10.35	n.s.
Maningwa ...	.84	9.47	...	10.76
Mica Field ...	1.02	10.05	10.92	n.s.
Montrose ...	.83	11.90	13.19	n.s.
Mpandegutu ...	1.22	9.86	11.23	n.s.
Mukwe River Ranch ...	.86	8.67	10.19	10.13
North Banket ...	1.48	10.15	12.16	n.s.
Nyapi ...	1.30	11.12	12.89	n.s.
Nyarora ...	2.38	9.40	13.19	n.s.
Nyati ...	.62	10.83	11.82	n.s.
Palm Tree Farm ...	1.40	9.82	11.28	10.77
Puri ...	.79	14.05	15.84	n.s.
Raffingora ...	2.15	11.51	14.21	n.s.
Richmond ...	1.91	8.68	10.80	n.s.
Robbsdale ...	1.78	7.14	9.03	n.s.
Romsey ...	1.37	8.40	10 61	n.s.
Silater Estate ...	.56	9.87	10.62	n.s.
Sinoia ...	1.66	12.54	14.36	10.87
Sinoia's Drift ...	.52	8.24	9.36	n.s.
Sipolilo ...	2.40	15.16	17.86	10.82
Umboe ...	.27	10.33	10.60	n.s.
Umvukwe Ranch ...	1.41	9.76	11.37	11.06
Woodleigh ...	2.03	10.13	12.42	n.s.
Yeanling ...	1.82	13.51	15.63	n.s.
Salisbury—				
Avondale (Broadlands) ...	1.33	9.26	10.91	11.28
Ballineety ...	3.07	6.56	9.84	n.s.
Botanical Experiment Station	.82	8.93	10.09	11.06
Bromley ...	1.81	9.98	12.10	11.61
Cleveland Dam ...	2.20	10.41	14.36	11.02
Gwebi ...	2.64	7.70	10.67	11.34
Hillside ...	1.21	...	...	9.94
Lochinvar ...	1.69	6.09	8.17	10.39
Manor Farm ...	1.77	9.55	11.62	n.s.
Pendennis ...	.71	9.70	10.65	n.s.
Salisbury Agricultural Dept.	1.28	8.29	9.78	n.s.
Sebastopol ...	2.12	9.74	11.96	11.64
Selby ...	...	...	...	n.s.
Stapleford ...	3.16	7.93	11.30	12.00
Tobacco Experiment Station	1.37	7.67	12.77	n.s.
Vainona ...	.89	9.27	10 44	11.73
Western Commonage ...	2.77	7.26	10.52	12.75
Sebungwe—				
Sikombela ...	1.76	9.44	11.12	11.43
Wolverley ...	1.51	9.10	10.68	n.s.

RAINFALL—(*Continued*).

STATION.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	1.92	...	...	n.s.
Fountains ...	.90	...	...	n.s.
Mount Darwin ...	1.21	8.81	10.29	11.77
Rusambo ...	1.85	6.81	8.95	n.s.
Inyanga—				
Inyanga ...	2.18	10.29	12.98	13.24
Juliasdale ...	...	8.92	...	n.s.
Rhodes Estate ...	3.75	6.53	11.54	13.77
Makoni—				
Ardlamont ...	3.75	...	...	n.s.
Eagle's Nest ...	4.94	8.12	13.06	11.83
Mayo Ranch ...	nil	5.49	5.49	n.s.
Nyogeni ...	...	7.14	...	n.s.
Kelvin ...	...	...	...	n.s.
Wensleydale ...	...	...	...	n.s.
Marandellas—				
Fault Farm ...	4.34	8.21	12.65	n.s.
Mazoe—				
Argyle Park ...	2.34	8.99	11.59	n.s.
Atherstone ...	1.35	5.87	7.57	n.s.
Bellevue ...	1.58	9.26	10.84	n.s.
Benridge ...	...	...	...	n.s.
Bindura ...	.52	7.16	8.32	11.81
Ceres ...	1.91	5.80	8.09	12.69
Chipoli ...	.61	9.67	10.75	11.29
Citrus Estate ...	1.88	8.75	11.64	11.46
Craigengower ...	.47	9.30	10.55	11.06
Dandejena ...	1.18	7.69	9.03	n.s.
Donje ...	1.49	13.28	15.15	n.s.
Dundry ...	...	...	...	n.s.
Frogmore ...	.75	9.77	10.88	n.s.
Glen Divis ...	1.63	11.53	13.50	n.s.
Glen Grey ...	1.03	10.76	12.07	n.s.
Hinton ...	1.32	8.76	...	n.s.
Great B ...	1.20	9.80	11.00	n.s.
Kilmer ...	.64	9.53	10.66	11.35
Kingston ...	2.00	6.74	9.16	12.68
Mazoe ...	1.56	6.45	8.06	11.55
Maienzi ...	1.21	...	...	n.s.
Marston ...	.10	7.14	7.49	n.s.
Mgutu ...	1.77	11.76	13.53	n.s.
Muripfumba ...	1.33	8.41	10.14	n.s.
Omeath ...	1.44	12.76	14.49	11.15
Pearson Settlement ...	2.88	8.73	11.61	n.s.
Pembi Ranch ...	1.84	8.93	10.82	n.s.
Riversdale Estate ...	1.20	11.37	12.57	n.s.
Ruia ...	1.76	9.54	11.39	12.47
Horta ...	.75	12.83	13.58	11.44
Rustington ...	.83	8.39	9.22	n.s.
Shamva Mine ...	1.58	6.94	9.43	11.79

RAINFALL—(*Continued*).

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Stanley Kop ...	2.42	8.55	10.97	10 95
Sunnyside ...	1.69	12.65	14.52	11.61
Teign ...	1.19	8.85	10.28	n.s.
Usk ...	1.75	11.23	13.25	11.65
Vergenoeg ...	...	...	...	n.s.
Virginia ...	1.70	10.02	11.95	10.86
Visa ...	.81	10.82	11.83	n.s.
Woodlands ...	1.14	6.76	8.18	11.62
Zombi ...	1.60	9.02	11.01	12.47
Mrewa—				
Maryland ...	.78	10.22	11.00	11.80
Mrewa ...	1.64	9.10	10.88	12.34
Selous Nek ...	1.89	4.81	...	11.69
Mtoko—				
Makaha ...	.68	10.08	11.03	11.14
Mtoko ...	3.02	8.83	12.30	9.79
Nyaderi Mission ...	2.51	9.54	12 65	n.s.
Salisbury—				
Arcturus ...	1.23	8.87	10.77	12.97
Calgary ...	1.29	8.68	10.08	n.s.
Chindamora Reserve ...	1.64	8.37	10.21	n.s.
Chinyika ...	1.84	9.63	12.60	n s.
Glenara ...	1.45	9.86	11.31	11.07
Goromonzi ...	1.75	10.76	12.57	13.43
Hatcliffe ...	.86	7.35	8.28	11.78
Hillside (Bromley) ...	2 14	12.37	15.76	n.s.
Kilmuir ...	1.87	9.96	12.22	n.s.
Meadows ...	.98	10.36	11.47	13.39
Selby ...	2.26	8.00	10.52	10.74
Springs ...	.95	6.48	7.62	n.s.
Teviotdale ...	...	...	...	n.s.
Zone E.:				
Belingwe—				
Belingwe (N.C.) ...	.94	2.56	3.50	8.65
Doro ...	.77	...	...	n.s.
Shabani ...	.96	1.97	2.93	n.s.
Bikita—				
Angus Ranch ...	1.47	2.26	3.93	8.85
Bikita ...	1.11	3.82	5.87	n.s.
Devuli Ranch ...	...	2.89	...	n.s.
Charter—				
Buhera ...	4.13	8 54	13.34	12.84
Chibi—				
Chibi ...	3.28	1.88	5.34	8.64
Lundi ...	2.46	...	...	7.88
Chilimanzi—				
Alanberry ...	1.97	7.29	9.45	...
Driefontein ...	1.02	6.02	7.41	10.09
Felixburg ...	1.53	5.88	7.41	11.08

RAINFALL—(*Continued*).

STATION.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Chilimanzi (continued)—				
Grootfontein ...	.84	5.09	6.03	10.69
Induna Farm ...	1.49	6.47	8.20	11.65
Mtao Forest ...	1.81	4.79	6.77	n.s.
Requeza Estate ...	1.75	6.32	8.23	n.s.
Thornhill ...	1.80	4.24	6.64	n.s.
Gutu—				
Alheit Mission ...	.33	...	...	8.58
Chindito ...	2.31	6.18	9.18	11.93
Eastdale Estate ...	3.52	6.22	9.93	11.81
Gutu ...	3.33	8.96	14.27	11.12
Glenary ...	2.18	8.82	11.33	9.54
Gwelo—				
Glencraig ...	1.10	6.08	7.40	n.s.
Partridge Farm ...	2.63	4.24	7.43	13.07
Sheep Run Farm ...	2.37	5.14	8.46	11.95
Inyanga—				
St. Trias' Hill ...	6.42	6.78	13.68	14.11
Insiza—				
Roodeheuvel ...	.86	6.82	...	9.73
Makoni—				
Craigendoran ...	3.38	10.28	13.90	10.78
Forest Hill ...	3.56	6.11	10.27	11.38
Gorubi Springs ...	7.27	3.69	11.04	11.56
Inyagura ...	4.55	5.31	9.86	n.s.
Makoni Kop ...	3.67	8.23	12.00	n.s.
Mande ...	...	...	...	n.s.
Mona ...	3.34	5.42	8.80	12.36
Monte Cassino ...	2.98	13.38	16.69	12.71
Romsley ...	...	...	...	n.s.
Ruati ...	3.81	5.10	9.47	n.s.
Rusape ...	5.37	3.67	9.08	11.11
Tablelands ...	3.61	...	...	n.s.
Tsungwesi Ranch ...	...	...	...	n.s.
Springs ...	7.29	9.62	16.95	11.45
Whitgift ...	2.53	6.70	9.44	n.s.
Marandellas—				
Benongwe ...	3.51	6.65	10.36	11.83
Delta ...	2.03	5.62	7.65	11.72
Elandslaagte ...	5.42	5.25	10.67	n.s.
Land Settlement ...	2.92	7.39	10.31	11.80
Lendy Estates ...	1.59	10.56	12.15	12.64
Lushington ...	2.16	5.22	8.46	n.s.
Macheke ...	2.70	8.64	11.39	12.90
Marandellas ...	4.17	8.41	12.75	13.43
Nelson ...	5.35	...	...	10.37
Tweedjan ...	5.28	7.78	13.21	12.60
Wenimbi ...	7.14	...	...	n.s.
White Gambolo Ranch ...	4.56	7.47	15.12	n.s.

RAINFALL—(*Continued*).

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(continued)				
Melsetter—				
Brackenbury ...	2.53	...	...	19.54
New Year's Gift ...	1.84	4.53	7.44	n.s.
Tom's Hope ...	4.12	4.31	9.80	17.66
Ndanga—				
Doornfontein ...	.93	5.25	6.53	9.61
Manjirenji ...	2.34	3.72	7.44	n.s.
Marah Ranch ...	1.63	6.18	7.81	11.46
Zaka ...	2.40	5.54	8.10	14.10
Selukwe—				
Aberfoyle Ranch ...	.78	5.86	6.89	11.46
Danga ...	...	...	...	n.s.
Hillingdon ...	1.13	8.05	10.10	11.54
Impali Source ...	.92	7.07	8.50	n.s.
Rio ...	2.63	6.65	...	10.81
Safago ...	1.59	8.32	...	11.91
Selukwe Gaol ...	...	5.76	...	n.s.
Tokwe Block ...	.74	5.91	6.68	n.s.
Woodlands ...	1.10	6.15	...	n.s.
Umtali—				
Alicevale ...	2.13	7.09	9.51	11.48
Argyll ...	2.99	4.41	7.71	11.43
Embeza ...	6.82	11.01	20.60	n.s.
Fairview ...	3.35	5.80	10.73	n.s.
Fern Valley ...	2.71	5.83	9.18	n.s.
Forest Farm ...	1.66	5.72	7.76	n.s
Jerain ...	2.19	5.51	8.22	11.71
Mutambara Mission ...	2.21	8.10	11.39	10.79
Odzani Power Station ...	2.22	10.29	13.24	13.29
Park Farm ...	2.90	9.34	13.59	n.s.
Premier Estate ...	2.09	6.34	8.76	11.20
Sarum ...	2.15	5.04	7.19	10.37
Stapleford ...	7.71	...	..	26.01
St. Augustine's Mission ...	3.28	8.02	12.92	n.s.
Transsau Estate ...	3.61	4.38	8.28	n.s.
Umtali Gaol ...	2.23	5.62	8.59	11.96
Victoria—				
Brucehame ...	.84	6.80	7.96	10.15
Cambria ...	1.69	4.43	6.33	n.s.
Chevedon ...	2.34	4.70	7.91	n.s
Clipsham ...	1.20	3.62	5.09	10.36
Gokomere ...	2.20	2.73	5.23	10.53
Makowries ...	1.62	6.47	8.47	n.s.
Mashaba ...	1.57	4.11	5.72	n.s.
Miltonia ...	2.41	3.14	5.81	n.s.
M'Sali ...	1.58	3.32	5.45	n.s.
Riverdene North ...	1.08	4.17	5.65	10.70
Salemore ...	.77	6.08	7.22	n.s.
Silver Oaks ...	1.83	5.28	7.57	10.38
Stanmore ...	.73	4.71	5.53	n.s.
Victoria ...	1.39	4.86	6.25	9.60
Zimbabwe ...	3.31	4.70	9.30	n.s.

RAINFALL—(Continued).

Station.	1926. Nov.	1926. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone F.:				
Melsetter—				
Chikore ...	2.85	7.44	12.96	14.09
Chipinga ...	3.09	6.74	...	14.59
Lettie Swan ...	4.49	8.40	14.79	n.s.
Melsetter ...	2.61	8.94	14.78	15.44
Mount Selinda ...	1.82	9.68	15.52	20.50
Springvale ...	3.50	...	...	n.s.
Vermont ...	5.86	9.61	19.50	21.13
Umtali—				
Chimeze ...	3.39	...	...	n.s.
Hoboken ...	...	...	...	n.s.

Export of Cattle from Southern Rhodesia, 1926.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	437	...	...	898	...	...	...	...	...	1,335
February ...	679	4,292	...	170	...	...	...	...	...	5,141
March ...	872	4,484	...	...	...	...	...	...	...	5,356
April ...	545	3,877	...	1,227	795	15	...	...	...	6,441
May ...	812	3,521	180	1,233	185	...	...	...	...	5,931
June ...	1,056	5,539	...	967	1,647	17	12	...	...	9,288
July ...	1,606	8,153	...	428	51	...	61	14	...	10,313
August ...	1,958	6,902	...	1,319	127	...	126	66	...	10,498
September ...	1,975	6,159	...	846	...	...	62	16	2	9,060
October ...	1,542	5,110	...	637	...	...	83	...	...	7,372
November ...	431	1,537	130	279	24	...	68	...	...	2,469
December ...	337	21	...	1,012	...	...	104	...	...	1,474

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Feb.	March
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	...	12
Banket Junction	Various farms	C. C. K. Anderson	5	5
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	24	31
Bindura	Bindura Farmers' Hall	W. E. Fricker	12	12
Bromley	Farmers' Hall, Bromley Siding	J. H. Shirley	2	2
Bubi	Queen's Mine	E. C. Gondin	8	8
Chakari	Various farms	L. T. Tracey	17	17
Chatsworth	Makowries Farm	A. W. White	...	5
Concession (Mazoe)	Concession Hotel	Frank Allen	8	8
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	12	12
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	3	3
Enterprise	Farmers' Hall	John Johnstone	7	7
Essexvale	Essexvale	W. H. V. Hoste	20	20
Felixburg—Gutu	Various Farms	C. L. Burrows	12	...
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	1	1
Gadzema	Gadzema	Hugh G. Williams	13	13
Gatooma	Speck's Hotel	C. M. Davenport	19	19
Gazaland	Court House, Chipinga	D. M. Stanley	7	7
Greystone	Quarrie Farm	C. B. Liebenberg	...	12
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	18	...
Hartley	Old School Room, Hartley	J. de L. Nimmo	18	18
Headlands	Headlands	J. A. Eve	...	...
Insiza—Shangani	Shangani Hotel	K. Carlsson	...	...
Insiza South	Farm Lancaster	J. Campbell	10	10
Inyanga	Inyanga	E. J. Hacking	12	12
Inyazura	Inyazura	D. de Kock	4	...
Lalapansi	Lalapansi	E. Buckley	12	12
Lomagundi	Sinoia	F. W. Robertson	...	...
Lomagundi West	Various farms	E. Morton	13	20
Macheke	Macheke	M. J. Palmer	...	12
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	6	6

Makwiro	Makwiro	F. H. Howard	18	18
Makoni	Rusape	J. G. Monckton	12	12
Marandellas	Marandellas Farmers' Hall	C. A. Elliot	4	4
Marandellas, Southern	Various farms	M. C. Myers	2	2
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	11	11
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	10	10
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	19	19
Mazoe (Glendale)	Farmers' Hall, Glendale	M. Graham	9	9
Melsetter	Court House, Melsetter	Dr. Rose	10	10
Melsetter (North)	Cronley	R. Wodehouse	Not	received
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	9	9
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	26	26
Northern Umtali	Farm Summerfield	A. Tulloch	Not	received
North Umniati	———	J. F. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	4	4
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	5	5
Poorte Valley	Various places	J. Norton Thompson	19	19
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	19	19
Salisbury South	Various farms	P. Linton	23	30
Selukwe	The Hotel, Selukwe	W. T. Simpson	4	4
Shamva	Shamva Hotel	E. Butler	17	17
Two Rivers Farming Association	Various farms	W. M. Parsons	12	12
Umboe (Branch of Lomagundi F.A.)	Various farms—Feb. mtg., Long Valley	A. J. Hawkes	12	12
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Lieut.-Col. W. M. Royston Pigott	12	12
Umtali	Drill Hall, Umtali	A. Howat	3	3
Umvuma and District	Umvuma	N. B. Colling	Not	received
Victoria	Victoria	H. Payne	11	11
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	E. F. Willmore	9	9
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

February.

BEE-KEEPING.

In some districts a second flow of honey may be looked for from the veld flowers and late growing crops. Honey being secured in either sections or shallow frames should not be permitted to remain too long on the hive at this time of year, as it will become soiled with the bees' feet. Robbers may be anticipated, and this is a sign that the honey flow is nearly over. Where stocks are short of food, feed rapidly inside the hive; excellent feeders can be supplied by appliance dealers. Queenless stocks can now be re-queened, or two stocks can readily be united by previously dusting each lot with household flour. Grade and dispose of honey.

CITRUS FRUITS.

The notes on planting still apply if trees are planted this month, an operation which, however, it is not desirable to leave so late. Trees planted after about the end of January may only get established when it is too late that season for them to commence growth, the consequence being that what growth there is is still sappy at the approach of the cold weather and so stands a chance of being nipped. In such case the tree would have been better left in the nursery row to be lifted and transplanted into the orchard the following spring.

By the end of February or early March the cover crop should be ready to plough into the orchard, with the possibility of sufficient rains after it is done to assist in rotting the plants in the soil. A continuous watch should be kept for insect pests, and fumigation or spraying undertaken immediately any pest is observed. If no cover crop has been sown, allow weeds to grow and plough under before seeding if possible. Destroy all fruit infested with citrus codling moth by burning or burying deeply. Do not allow the fruit to fall to the ground before destroying it, but pick all affected fruit as soon as it is observed. Considerable damage is done in some orchards by citrus codling moth, which can be controlled to some extent by using a poisoned bait made up as follows:—

Arsenate of lead (paste), 2 lbs. or 3 ozs.
or Arsenate of lead (powder), 1 lb. or $1\frac{1}{2}$ ozs.
Treacle, 4 galls. or $\frac{1}{2}$ gall.
or Sugar (cheapest), 40 lbs. or 4 lbs.
Water, 40 galls. or 4 galls.

Apply lightly in a coarse spray, getting a few large drops here and there in centre of trees. Apply from beginning of the year until about early April every fortnight, and more frequently if rains wash off bait.

CROPS.

During this month the farmer's energies will in the main still be concentrated on keeping his lands thoroughly clean. A special effort should be made to destroy such weeds as Mexican marigold, burr weed and Mexican poppy before the plants set seed. Where maize lands become excessively wet, the wing-shovel plough can be used with advantage to assist in the removal of surplus water. Catch-crops of buckwheat can often be sown up to the end of the month. Napier fodder and other

grasses and kudzu vine should be transplanted without delay. When weather conditions allow, hay-making should commence this month; the earlier the grass is cut after coming into flower, the better the hay obtained, and there are usually a number of good hay-making days in February. If Sudan grass shows signs of leaf stripe, it should be cut at once, as the second growth is usually free of disease.

DAIRYING.

This is the flush season so far as dairy produce is concerned. If cream is to be sent to the creamery, adjust the separator so that a cream of from 40 to 50 per cent. butter-fat content is obtained. This is usually got when the cream drops vertically from the cream outlet. If this vertical fall is not obtained, adjust the cream screw until the desired result is attained. As there is a greater strain than usual on the mechanism of the separator during the flush months, see that the separator is mounted dead level and that a good quality oil only is used.

When butter is made on the farm, put the cream and the washing water out overnight. By this means the temperature of both the cream and the washing water is reduced to 65 degrees or thereabouts. If the cream is well thinned with weak brine, a good grain can be obtained when the cream is churned before daybreak. Unless the butter is churned into the granular condition and is well washed, it will not keep.

The cheese in the store room during wet weather is apt to develop mould. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the cheese. Rubbing the cheese with a cloth moistened with a weak solution of formalin usually checks the mould, but the development of mould on the exterior of the cheese cannot be regarded as a serious fault, as it comes off when the bandage is removed. During these months care must be taken not to use over-acid milk for cheese-making. If this is used, a hard dry cheese will result. Great care should be taken of the starter. If any gassiness is developed, the starter must be discarded. The cheese store-room must be kept dark and flies excluded.

DECIDUOUS FRUITS.

This is the time to carry out summer pruning, after harvesting the crop, and when the flow of sap begins to become sluggish.

FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

FORESTRY.

Complete planting out of ever-greens. Sow in nursery seeds of slow growing species such as cypress, pines, etc. All planting should be completed this month, in the early part if possible.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at this time and for the next five months are valuable.

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

STOCK.

Cattle.—Grass should now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little crushed and soaked mealies, or something similar, may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose and move to fresh grazing and kraals.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Bulawayo and Nyamandhlovu Native Districts.
7.1.27.	Government Notice No. 5 eliminates Bellevue township and the portion of Bellevue Farm owned by Mr. H. Hill from the area of infection.
	IMPORTATION OF SCRAP TOBACCO, ETC.
31.12.26.	Government Notice No. 763 prohibits the importation from the Union of South Africa into Southern Rhodesia for consumption therein of scrap tobacco, dust tobacco, tobacco stems and tobacco in any form manufactured therefrom.
	NATIVE CATTLE DEALER'S LICENCE.
31.12.26.	Government Notice No. 768 prescribes that from the 1st January, 1927, the cost of the licence shall be £10.
	BRANDING REGULATIONS.
21.1.27.	Section 10, sub-section (b) of Government Notice No. 391 of 1908 is cancelled and the following substituted:— "10 (b). In the case of cattle the first brand shall be imprinted on the near rump, shoulder, neck, cheek or horn, and every second or subsequent brand shall be imprinted at a distance of not less than one and a half inches from and directly underneath the brand last imprinted, or, where brands are imprinted on the horn, below or beside the brand last imprinted. In the event of no space being available for subsequent brands on the parts of the animal indicated above, brands may be placed on corresponding parts on the off side of the animal." (G.N. 26.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Barley for Malting.—As will be seen from the article on barley which appears elsewhere in this issue of the Journal, the South African Breweries, Ltd., are offering a fixed price of 20s. per bag of 150 lbs. for barley of suitable quality delivered to their brewery at Salisbury, and this price is guaranteed for two years. The Breweries have for some time encouraged the growing of barley in this Colony, and last year they purchased over a thousand bags locally for malting purposes. As a winter crop grown under irrigation on suitable soil, barley does well in this Colony, and yields of 12 bags per acre and over are not uncommon. The

cereal can also be grown on moist vlei land, but the yield in such areas is usually lower than that from irrigated lands. The depredations of birds have to be guarded against, and measures for combating the evil are given in the article by Mr. Samuels. Apart from its malting qualities, barley is a good stock feed, especially for pigs, and the meal is fed extensively to dairy cattle in Northern Europe.

The guarantee of a fixed price for barley accepted by the Breweries should make its appeal to farmers, and we commend the hints on cultural treatment given in the article to their attention.

Importation of Stock into Belgian Congo.—We publish elsewhere in this issue of the Journal the conditions under which domestic animals, cattle, horses, pigs, donkeys, mules, sheep and goats may be imported into the Province of Katanga by rail from the south through the port of entry, Sakania.

All animals must be accompanied with a certificate (which serves as a permit) by a Government veterinary surgeon as to freedom from disease, and including the following particulars:—Name and address of seller, place of entrainment, kind of animal, number, sex, breed, and name and address of importer. Further, a notification must be made to the Director of Agriculture, Elizabethville, at least a fortnight before the animals are being forwarded, giving the full particulars required for the veterinary certificate of health.

All documents and animals are examined at Sakania and everything must be in order before the animals are allowed to proceed to their destination. The animals are subject to what quarantine is deemed necessary, and all expenses incurred are to be borne by the importer or consignor.

Coffee Culture.—The possibilities of coffee growing are attracting attention in Southern Rhodesia to-day, and there is a fairly large acreage planted with the crop in Mashonaland, principally along the eastern border. Coffee was, of course, grown in the Melsetter district some years ago, and

successful results were obtained until the groves were invaded by the coffee leaf disease (*Hemileia vastatrix*), which rendered the growing of the crop unprofitable. Efforts to establish coffee in Rhodesia to-day are proceeding on three main lines, viz.: (1) by spraying the bushes periodically to prevent disease; (2) by selecting a well drained soil; (3) by planting varieties likely to be suitable to the locality. Shade appears to be beneficial to coffee in some parts of the Colony, but this is a factor which requires further investigation. We hope to publish an article on coffee growing in this Journal before the start of the next planting season, when the items enumerated will be elaborated.

In considering the possibilities of coffee growing it should be realised that a profitable return cannot be expected for four years, and that, except in the eastern part of the Colony, where the rainfall is greater than elsewhere, it will probably be necessary to provide irrigation facilities during the dry season. It should also be noted that seed can only be imported into this Colony under a permit provided by the Chief Inspector, Importation of Plants Regulations. The granting of such a permit is very carefully considered, in view of the extreme danger of introducing pests and diseases inimical to the coffee plant. We understand, however, that it is possible to procure suitable seed locally. With a view to encouraging the industry, the Government recently distributed seed to prospective growers for testing in different districts, and it is hoped in this way to obtain definite information as to the suitability of the crop over a wide area of the Colony.

It is interesting to note that a sample of coffee, which was sent to London recently by Mr. W. H. Greene, of Skiddaw, Shamva, was favourably reported upon and valued at 130s. per cwt.

The Meat Trade in France.—We gather from an Exchange that the present situation of the meat trade in France has been under discussion in the Academy of Agriculture. The two principal questions which arose were:-

1. Is it necessary for France to import frozen meat?

2. If it is, in what form and under what conditions would these importations be most advantageous to France?

With regard to the first question, the answer is decidedly —Yes. The best proof that France is no longer able to supply its own needs is seen in the customs statistics, which show that there were imported into France, either directly or through England: in 1921, 62,000 metric tons of frozen meat; in 1923, 65,000 tons; in 1924, 95,000 tons; in 1925, 97,500 tons.

Having established the fact that it is absolutely necessary to import meat, the question then arises: where from? South America is at present the principal exporter. At the moment, France buys, either directly or indirectly, an average of 100,000 metric tons of frozen meat from the Argentine, while the latter buys nothing from her in exchange. It is proposed that a Franco-Argentine commercial agreement should be entered into by which the Argentine should be asked to supply meat (preferably chilled) produced from French breeds of cattle, rather than from English, as heretofore. In this way France could sell breeding animals to the Argentine, while at the same time guaranteeing to buy a certain number of tons of meat within a definite period.

A further proposal was made that, owing to the scarcity of breeding animals in France, young South American cattle (exclusively male calves of from 8 to 10 months, castrated) should be bought to fill the pastures early in the spring. This proposal did not meet with such a favourable reception, as it was objected that such a plan might lead to the importation of new and serious diseases. A less dangerous plan would be to import live fat cattle, but these should be killed at the port or brought with adequate precautions to the larger cities, in limited quantities, so as not to flood the markets. The same plan might be adopted with sheep. In this way all danger of disease would be avoided, and arrangements could then be made with regard to exporting breeding animals to South America or obtaining some other advantages.

Retirement of Mr. C. P. Lounsbury.—The February number of *Farming in South Africa* contains the announce-

ment of the retirement of Mr. C. P. Lounsbury, Chief of the Division of Entomology in the South African Union, as from 31st January of the present year.

Mr. Lounsbury, who is an American by birth and training, took up his duties as first official entomologist in South Africa in July, 1895. During the years immediately following his appointment he devoted himself mainly to the entomological problems connected with the fruit industry in the Western Province of the Cape Colony, and took an active part in the encouragement of what was later to prove an important source of prosperity to the Colony.

As early as 1898, however, he was already giving some attention to the habits and life histories of various species of ticks infesting domestic animals in the Cape Colony. In 1900 he secured his first success in reference to the transmission of disease by ticks, by demonstrating that heartwater, a fatal disease of small stock much in evidence in the Eastern Province of Cape Colony, is transmissible by the Bont Tick (*Amblyomma hebræum*). Subsequent to this the roles played by the Dog Tick (*Hæmaphysalis leachi*) in the transmission of biliary fever of the dog and by ticks of the genus *Rhipcephalus* in reference to East Coast Fever were elucidated.

His studies of the bionomics of ticks not only constitute the foundation on which dipping procedure is based in South Africa, but Mr. Lounsbury himself carried out preliminary experiments with the use of arsenite of soda in destroying ticks and demonstrated the advantage attendant upon the addition of soap in increasing the wetting power of the dip. Following this preliminary work, a series of extensive experiments under farm conditions led forward towards the adoption of the now general procedure.

Whilst Mr. Lounsbury's name is likely to be mainly associated with his studies of ticks, which have led to results of inestimable benefit to South Africa, there is another aspect of his work of a less conspicuous nature, which has probably conferred no less benefit on the sub-continent. Almost from the moment of assuming official responsibility he urged the necessity of legislative control of insect pests both in reference to preventing importation of injurious insects, for which legislation was already in force, and to checking dissemination

of pests within the Colony. In 1896 we find the first Government plant fumigating chamber in the world erected at the Capetown docks, and close supervision being exercised over plant imports. It was not until 1905, however, that he succeeded in persuading the Government to pass laws controlling the movement of plants from nurseries with a view to ensuring their freedom from pests, although the first Bill with this object was drafted as early as 1896.

After the accomplishment of Union Mr. Lounsbury became Chief of the Division of Entomology, and we gather that his time became mainly absorbed by the administrative duties inseparable from his position. One cannot but feel that the scientific world has lost much by this fact.

It may be of interest to note that Mr. R. W. Jack, the present Chief Entomologist in this Colony, was assistant to Mr. Lounsbury at Capetown from March, 1903, to July, 1909, and especially associated with him in the tick studies connected with the transmission of East Coast Fever and in the preliminary experiments in the use of arsenical dips against these pests.

Cotton.—That cotton can be grown in certain parts of the Colony has been amply proved, and we believe that Southern Rhodesia will, in time, produce a steady out-turn of good quality cotton. It is true that the crop is not very popular in Rhodesia at the present moment, and for this there are very good reasons, which can be summed up in the words—adverse seasons and low prices. Unfortunately the heavy rains which fell towards the end of last season delayed the ripening of the crop, so that, combined with an abnormal infestation of the cotton stainer, the bolls opened so badly that the cotton was difficult to pick, and much of it turned out to be of very poor quality. This in itself was sufficient to damp the ardour of cotton growers, but when prices of raw cotton slumped in addition, the crop speedily fell from favour. This was only natural, and the consequence of it is that there is a considerable reduction in the acreage under cotton this season. This in some respects may be well, for a good deal of cotton has in the past been planted in unsuitable localities and at altitudes

where the chances of success have been slender. With the experience of the last two seasons behind them, farmers who are planting cotton this season—and the acreage is quite considerable—will select only such areas as afford a reasonable chance of success. The slump in the price of raw cotton is, of course, due to over production, and the subject is exhaustively dealt with in a very enlightening article which appears in the *Empire Cotton Growing Review* for January.

It is stated that the crop of cotton in North America alone, cotton which is of the "bread and butter" type of almost universal cultivation, is estimated to exceed by at least three million bales the probable world's consumption in the mills for 1927. The American crop of the previous year was also a very heavy one, with the result that in order to arrest the fall in prices, four million bales are about to be withdrawn from sale. It is considered that low prices will have the effect of reducing the acreage planted with cotton in America this year, and consequently higher prices may be expected. Even to the spinner and the manufacturer this sudden lowering of prices is by no means an unmixed blessing. It is stated that already the Bombay mills are reducing output on account of the low prices and the heavy stocks on hand. The cotton is not sold in its finished condition as soon as bought, but undergoes various manufacturing processes lasting over a period of some months, so that when it is actually placed upon the market its economic selling price may stand in no necessary relation to the price of raw cotton at that particular time.

What the manufacturer desires above all things—and, we might add, the grower also—is a stable price for raw cotton.

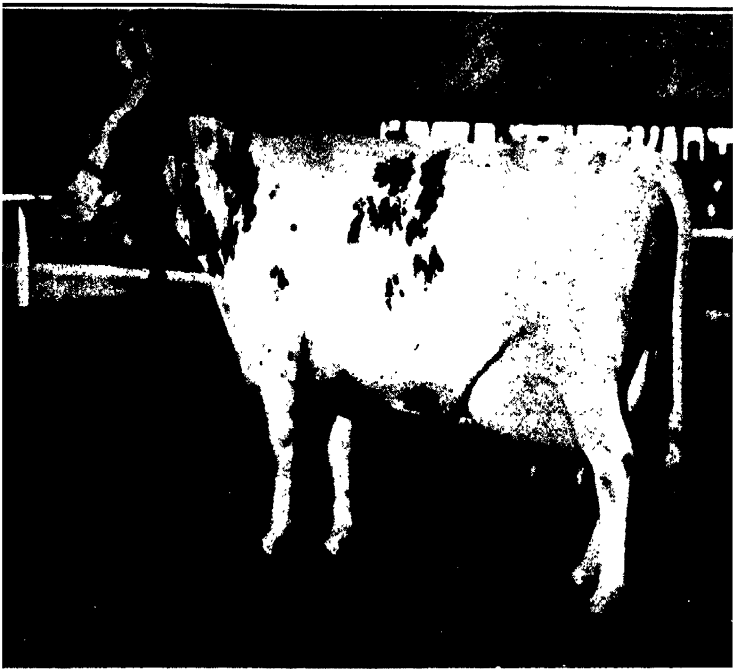
The article emphasises two points which concern growers in Rhodesia very closely, and these are the need for a variation of crops and the production regularly and not spasmodically of good quality cotton. Fortunately in this Colony we have a wide variety of crops which can be grown successfully, and there is no need to risk everything on one particular crop. Apropos of this, it is written, "Monopoly of one crop by one country cannot be considered as a good

thing, for many reasons; but 'single crop' cultivation is equally little to be desired, and both should be done away with so far as is practicable, the one by extension of cultivation into different countries, the other by the introduction of variety and rotation of crops."

It has been shown that in this Colony maize following cotton gives surprising results, and this fact alone should give cotton an important place in any rotation practised. As regards the growing of the crop regularly, it is only by doing this that the grower can get the benefit of better prices. The article emphasises the fact that Empire cotton as a rule realises better prices than American middling, and this is a point to be remembered. To our knowledge last season, in spite of the adverse climatic conditions, on one estate in this Colony 31 bales of lint were secured from 65 acres and sold at 11½d. per lb. The following extract from the article puts the position very clearly:—"Even in a bad market there is never any difficulty in disposing of cotton of really good quality. Lancashire is perpetually tending to spin finer qualities of cotton, and wants all that she can get of these qualities. As Mr. Ormsby-Gore said at a recent meeting of the council, the future is going to depend upon our turning out a cotton that is always at least 2d. on American middling; if we only produce a thing as good as the latter, we shall have a very bad time."

We have sufficient experience of climatic conditions in Southern Rhodesia to know that every year is not a wet year, and we should not forget that the cotton produced three years ago fetched the desired premium over middling American. Neither should we forget that abnormally dry years are just as liable to occur as abnormally wet ones, and in such seasons it will always be a safe insurance to have a certain amount of land under cotton, which will withstand drought better than any other crop commonly grown in the Colony.

Farm Cost Accounts.—We published in an editorial notice which appeared in our January issue some particulars of the efforts made to encourage farm accounting in the United States of America, and it may be that a brief review of a similar movement in Great Britain will be of interest.



The champion cow at the Melbourne Show.

One of the best dairy herds in New South Wales. The farm is laid out in paddocks with specially selected grass. Five acres support one beast, supplemented with one feed of mixed concentrates at night—about 1 lb.

(Photographs kindly supplied by Mrs. Tawse Jollie.)

The first official attempt to encourage the keeping of farm costs was made at the end of the war, through the Ministry of Food and the Ministry of Agriculture, with a view to securing reliable statistics by which the economic condition of the farming industry could be judged. This effort was short-lived, being soon abandoned on the score of national economy. But with the repeal of the Corn Production Act the sum of £1,000,000 was made available in 1922 for agricultural education and research, and part of this money was devoted to the development of a State-aided costings system. The scheme is administered by the Ministry of Agriculture, and at the end of the year no less than eleven centres had been established to study farm economics and help local farmers with their accounts. The objects are: firstly, to provide the Government with a means of gauging the economic position of the different types of farming and their relative value to the community; secondly, to demonstrate to farmers the economies which can be effected in the running of the farm through keeping separate and accurate accounts for the different crops and stock; and thirdly, to persuade the less enlightened farmers to keep simple books which can help them to eliminate waste.

Among the first of these costings centres to be established was the one at Cambridge, and judging from the reports which are issued from time to time, it seems to be the most active. The farmer is asked to fill in each week a "labour sheet," a "food sheet" and, where necessary, a "tractor sheet," showing the allocation of labour, feeding stuffs and machinery for each day. When completed, these sheets are posted to Cambridge, and the results are tabulated to supply a balance sheet and detailed costs of production at the end of the financial year. The simplicity of these arrangements, together with the knowledge that the service is given free, that postage both ways is paid by the centre, and that the greatest secrecy is observed (each farm being known by a number) and only the broad results published of the various types of farming, has soon attracted more farmers than the centre can cope with. The method of costing adopted materially affects the profits or losses shown for the various departments of the farm, and so, to secure comparable results from different parts of the country, a uniform practice has been agreed upon by the advisory

economists. For instance, it is provided that such charges as rent, rates and insurance are to be allocated to the crops on an acreage basis, that no charge is to be made for the farmer's own time and management, that no interest is to be charged upon the farmer's own capital, and that home produced foods consumed on the farm are to be charged to the live stock at cost price.

The latest report from Cambridge, which can be obtained from the School of Agriculture for one shilling, refers to the working of six eastern counties' farms for the year ended Lady Day, 1925. All the six farms under review were of good size, the largest being 1,700 acres and the smallest 300 acres; two were predominantly grassland farms, which is unusual in the eastern counties. Although no generalisations can safely be drawn from the accounts of half a dozen farms, it is interesting to note that the farms with a high proportion of grass showed a net return on capital invested of only 3 per cent., while the four arable farms secured an average return of 8 per cent., ranging from 2.9 to 14 per cent. In explanation it is suggested in the report that the low return from the grassland farms is due to the comparative absence of dairy cattle and to a heavy investment in feeding cattle. Particularly illuminating are the figures referring to live stock. Feeding cattle lost their owners an average of 8.9 per cent. on the capital involved. Sheep showed a profit of 11.5 per cent., the individual returns ranging from a profit of 45 per cent. to a loss of 5 per cent. Pigs showed a loss of 67 per cent.—a heavy loss was to be expected during this period of falling prices. Dairy cattle gave a net return of 17 per cent. on the two farms where milking herds were kept. The most remarkable figure is that provided by poultry, the average profit being returned at 136 per cent. But here a word of explanation is necessary, for on all these farms poultry were treated as a side-line, and in consequence feeding and labour charges were put at a very low figure.

These average returns are of interest, but more important to the individual farmer concerned is the comparison of his costs of production and profits with those of other farmers in the district. It is here that the value to the farmer of this costings work is apparent. Take milk pro-

duction as an example. A farmer may find that his cost of production for the year works out at 14d. a gallon, while he sees that the average cost of production returned for other farms in the district is 12½d., and that in one case the figure is as low as 11d. He naturally turns to the advisory economist in charge of the local costings centre, who should be in a position to point out where the extravagances are in comparison with the costs of other farmers, and to give him useful advice. The development of this system of farm costings promises to supply facts and figures useful to the individual farmer, and for national purposes.

Erratum.

On page 132, line 39, of *Rhodesia Agricultural Journal* for February, for "Wildfire" read "*Bact. solanacearum.*"

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

A little learning is a dangerous thing;
Drink deep, or taste not the Pierian spring;
There shallow draughts intoxicate the brain,
And drinking largely sobers us again.

—Pope.

VETERINARY THERAPEUTICS.

A correspondent has written complaining that the veterinary notes recently contributed to the *Rhodesia Agricultural Journal* "have dealt almost entirely with vaccines, toxins, dipping and things like that, and would be far more helpful to the practical man if they gave him a few prescriptions composed of simple ingredients for the treatment of his stock." The indictment is undoubtedly true; in these articles the principle has been preached that "prevention is better than cure," and the use of drugs has not been advocated for several reasons.

In the first place, considerable harm is often done by "pouring drugs of which one knows little, into an animal of which one knows less, to cure a disease of which one knows nothing at all." In the old days, when medical men used to dispense their own medicines, there was a distinguished physician who used to admit that he prescribed no drug which he could not measure with the end of his spatula; and in the south of England one of the most famous and successful veterinarians rejoiced in the name of "old salts and blister," because his armamentarium consisted almost exclusively of blister, by means of which he secured for his patients the rest they needed; and salts, which purged them of the poisons which ladened their interiors.

It is probable that if the truth were known it would be found that more animals have been killed than cured by the well-intentioned but misguided application of drugs. No matter how much an animal has been neglected in health, as soon as it is sick there seems to be an innate desire to kill it with kindness—if the pouring of filthy concoctions down its throat and the fidgeting and fussing which are considered essential to good nursing can be regarded as kindness.

Vis Naturæ Medicatrix.—In nature a sick animal seeks solitude. If it is not driven from the herd it generally leaves it of its own initiative, and, seeking a sheltered place, remains there, refusing food and even water until it recovers or dies. How different is this to the treatment a sick animal often receives at the hand of its would-be benefactor, man, who, realising it to be ill, drives it into a kraal or shed, often hot and ill-ventilated, pours food which it cannot digest down its unwilling throat, kicks it when it is lying down to persuade it to get up and show how it is getting on, and in his anxiety gives it no peace. Frequently, to hasten and facilitate the passage of alleged remedies down the poor creature's throat, he grasps its tongue with one hand and pours fluids down the "wind pipe" with the other. And if perchance the poor animal, in spite of its treatment, decides to recover and once again commences to feed, an abundance of quite unsuitable food is heaped before it and allowed to decompose and become repulsive, if not absolutely harmful, to the patient. Indeed, it is less remarkable that a treated animal ever dies than that it ever recovers.

The Abuse of Drugs.—The drugs which are regarded as useful in the treatment of sick animals are innumerable, but as applied in practice very few exert any beneficial effects. Many, indeed, are actually harmful. Take, for example, the so-called *stimulants*. These are often a two-edged sword, for, having exerted a stimulant effect, they then become depressant. The well known "morning after the night before" effects of alcohol are not unknown even in Rhodesia. We are told that digitalis, a commonly used heart stimulant, in appropriate doses, "exerts its curative effects in one or more of the following ways: first, by

strengthening the action of the heart; second, by lessening the frequency of the heart's beats; third, by correcting irregular action of the heart." But "large doses are muscle poisons; they contract spasmodically and even tetanically the heart and other muscles, and kill usually by cardiac paralysis." (Finlay Dun.) Therefore, unless one possesses the knowledge to determine the appropriate dose, the drug is best left alone. Strychnine, again, is a very valuable stimulant if properly applied; in large doses, however, it is poisonous. Its effects are cumulative, and unless great care is exercised poisoning may be brought about by what would appear to be quite harmless doses. In other words, such drugs should only be used "secundum artem"—that is, according to art, scientifically, with a full knowledge of the results which will be caused by them.

Again, *purgatives* properly applied may be beneficial, but improperly applied may prove extremely harmful. Even the well-tried and old-fashioned remedy Epsom salts is not entirely free from danger. According to Finlay Dun, whose book on "Veterinary Medicines" is one of the most valuable works on the subject, magnesium sulphate should be given in 10 to 15 parts of water—that is to say, 1 lb. in 8 to 12 pints—whereas in practice a stockman commonly gives as much as 1 lb. in as little as 2 pints of water. In concentrated solutions, however, the drug is actually poisonous, causing serious depression of the respiration and paralysis of the nervous tissues. A year or two ago, at a veterinary medical association meeting in England, several general practitioners admitted that the number of cases which were poisoned by the so-called "red and yellow drenches," consisting chiefly of magnesium salts, which they were called upon to cure, were a profitable source of income to them. Several purgatives, such as castor oil, having exerted their laxative effect, are followed by a period of constipation, and it is sometimes doubtful whether as a result the last state of the patient is not worse than the first. Therefore before administering a purgative one must carefully consider, not only the immediate, but also the possible after-effects upon the animal.

Antiseptics are also very freely used, regardless of whether in the attempt to destroy the invaders of the body

one may not also be destroying the defenders. For many microbes are far more resistant to the effects of such agents than the leucocytes or white blood cells which are the body's first line of defence. During the great war strong antiseptics were largely replaced by irrigation with ordinary salt solution in the treatment of wounds. The futility of administering antiseptics to check intestinal fermentation has also been demonstrated. Recent correspondence in the medical press has shown that few if any of the many much advertised remedies ever enter the large bowel in such a form as to exert any antiseptic action there.

Physiology and Chemistry.—Another important factor in treatment is that as soon as a drug enters the animal's body it becomes profoundly altered by the physiological and chemical processes to which it is submitted. For example, in the ox, food and solid drugs undergo a partial mastication in the mouth, where they meet the alkaline saliva which assists the act of chewing and swallowing, and by virtue of an enzyme ptyalin, partially converts starches into sugar. In ruminants, ptyalin is present in smaller quantities than in carnivora. The food incompletely masticated is then swallowed and passes into the rumen, which may contain up to 40 gallons of pultaceous material. Here it undergoes a churning process through the contraction of the powerful muscular bands in the walls of the cavity, and, mixed with warm alkaline saliva, undergoes fermentation, by means of which the fibrous substances become softened and prepared for the further digestive processes. The rumen swarms with bacteria which assist in this breaking down process. Thus cellulose, starch, sugars and proteins undergo fermentation and chemical alterations rendering them more suitable for absorption and assimilation later. After a time rumination commences—that is, portions of the contents of the rumen are passed back into the mouth, where they undergo a second process of mastication and insalivation. When finely divided, the "bolus" is again swallowed, and by a wonderful piece of mechanism is passed along the œsophageal grove to the omasum, which, because of its many leaves, has been compared to a book, and is sometimes known as the "Bible stomach." Between these leaves the food undergoes a further grinding process and the fluid elements filter through

into the abomasum or true stomach. The ox spends some seven hours out of every twenty-four in ruminating. In some diseases rumination is suspended. When this happens it is futile to pour more food or fluids into the rumen, where, the natural process having ceased, the contents are already fermenting, producing gas and giving rise to poisoning and discomfort. In the abomasum an enzyme converts starch to sugar, and micro-organisms break down sugars to form lactic acid. Pepsin and hydrochloric acid are also secreted, and acting upon the proteins by a series of chemical changes, convert them into peptones. The albuminous foods are thus dissolved and a mixture of peptones, liquid fats and starches, termed chyme, is gradually passed on into the intestines. The intestines of the ox are extremely long, but of small calibre, the small intestine being about 130 feet long and the large intestine about 35 feet, with a capacity of 6 to 7 gallons. The cæcum or "blind-gut" is from 20 to 30 inches long and holds about 2½ gallons of contents. The colon is approximately 35 feet long, with the capacity of 6 to 8 gallons. The chyme, entering the small intestine, mixes with the bile, pancreatic and intestinal juices, and becomes alkaline; starch is further converted into sugar, fat becomes emulsified and the undissolved proteids are converted into peptones. The diffusible peptones and salts enter the portal vein, and the fat in a fine state of division enters the lacteals. In the large intestine the liquid chyme becomes more and more solid, is rendered acid by fermentative changes, and finally acquires the odour of fæces.

This lengthy but very incomplete description of the digestive processes in the bovine is given to show how very complicated it is and how many changes, mechanical and chemical, take place when food or medicine passes into the alimentary canal. When administering drugs, therefore, it is well to consider what may become of them and whether in the course of these changes they may not only become altered and rendered actually harmful, but may not seriously interfere with the natural processes of the body which are essential for health.

When it is remembered that the digestive processes in ruminants are entirely different from those in equines, and of equines from those in carnivora or omnivora, one realises

how very complicated is the art of veterinary treatment. In these days of motor transport most farmers would recognise the absurdity of filling the radiator with petrol, the petrol tank with water, or of seeking for an escape of gas with a lighted match. But even a Ford car is less fearfully and wonderfully made than the animal body. The mechanically minded farmer should treat his stock with the same common sense as he does his car. Often the height of common sense is to leave Nature to do her best unhindered: *Vis medicatrix naturæ* is not to be despised.

Idiosyncrasy.—Again, different species of animals respond to drugs in different ways. For example, the ox will tolerate an enormous dose of antimony, out of all proportion to that which can be applied with safety to other domesticated animals. Or again, dogs can support exceptional doses of morphia, but are highly susceptible to poisoning by carbolic acid. In selecting a drug one must know something about the animal's idiosyncrasies. There is an old and well-known saying, "One man's meat is another man's poison," and this principle applies also in animal therapeutics.

Neglect.—Another interesting feature about the home treatment of sick animals is that when in health they are so often neglected that disease supervenes and their vital processes are so reduced that no matter what treatment is applied they have not the strength to respond. This is often demonstrated by the urgent telegrams received at the Laboratory for so many doses of medicine for the treatment of so-called "fly-struck" cattle which have been over-worked and underfed for months. When exhausted and emaciated, trypanosomiasis is suspected, and an injection of antimony is expected, not only to cure the disease, but to build up the poor animals' depleted bodies and render them fit for hard labour again. A little forethought and generosity applied at the right time might have given the treatment a better chance of success. Or again, calves which have been denied a living ration and are suffering from what is known as "separator sickness" become victims of indigestion, diarrhœa and other ailments, and a medicine is expected to immediately put right the result of meanness, foolishness or neglect. The best rule of treatment is to treat the cause rather than the effect; too often the veterinarian is expected to cure the effect,

and out of consideration for his client rather than his patient, to overlook the cause. A suggestion that, in addition to his medicines, the animals should be properly fed and tended, might be regarded as impertinence.

In the long last it has to be admitted that medicines improperly applied are not infrequently a mixed blessing, and just as a loaded gun may prove a dangerous weapon in the hands of a monkey, may often do more harm than good. Used with wisdom and discretion they may perform miracles, but these qualifications are not always available. A good sportsman knows the futility of "firing into the brown"; rather he marks his bird and brings it down. The same principle applies in veterinary medicine.

All this may seem rather discouraging to the humane and kindly person who, out of the goodness of his heart, desires to relieve the sufferings of his animal friends in sickness and distress. He may, however, without the use of drugs, do much to help and relieve them. Shelter from the sun and wind, protection from the cold, an ever-present supply of cool fresh water, a little sweet hay always available, and palatable and easily digested food little and often, gentle hand-rubbing or well-timed exercise, sunshine and fresh air, rest and comfort, and withal a kindly voice and encouraging touch may do far more good than the many mysterious nostrums from the wagon, the kitchen or the druggist's store.

Specifics.—It has to be admitted that there are some simple remedies which are helpful in combating disease and restoring an animal to health, but it is proposed to leave it to others to sing their praises. There are also certain specifics, such as trypan blue for the treatment of redwater in cattle and biliary fever in dogs, Theiler's worm remedy, iodine in actinomycosis and—well, there may be others deserving of an article all to themselves. Nevertheless, in ordinary circumstances the domesticated animals of Southern Rhodesia are so free from the common ailments of stock, and, when sick, are generally the victims of epizootics which can be avoided by prophylactic measures, such as the dipping tank and various preventive inoculations, that the object of these "notes" has been to preach prevention rather than cure.

The Storage of Seed Potatoes.

By H. C. ARNOLD, Manager, Salisbury
Agricultural Experiment Station.

The importance of securing a good stand of any crop is fully realised by the majority of Rhodesian farmers, but many experience much difficulty in this respect with their potato crops. Owing to the comparatively high cost of the seed and of the manure and fertilisers required, this question of "stand" is of special importance when potato raising on a commercial scale is undertaken.

The chief cause of poor stands is seed of low viability, and this is often due to the improper treatment the seed receives while it is being held over from one season to the next. But if the right variety is chosen and the tubers are free from disease and insect pests, and if reasonable care is taken and proper methods are employed, little difficulty need be experienced in keeping the seed until it is required for planting.

When it is remembered that potatoes are living tubers which must breathe and respire in order to remain alive, and that chemical changes are constantly taking place within their tissues, it will be realised that they should be regarded as living but dormant plants rather than as ordinary seed, and that methods of storage which are suited to the latter are quite unsuitable for potatoes. For these reasons the tubers which are to be kept as seed for the next crop should be separated from the remainder as soon as possible after they are taken out of the ground, and should be stored under suitable conditons. They should not be piled together in large heaps, or kept in bags longer than necessary, for under such conditions they are liable to become over-heated. Exposure to very hot sun should be guarded against for the same reason. It may be mentioned, however, that our

experiments here have proved that the shade afforded by the native trees is sufficient protection, and even that is not necessary before 9 a.m. or after 4 p.m. Again, while slight frosts do not appear to harm potatoes, they should be protected by a light covering if the temperature is likely to fall much below freezing point.

Another harmful practice is that of stowing the tubers in layers which are too deep. When this is done all those from which light is excluded produce in due course numerous long, weak sprouts which, in their endeavour to reach the light, soon make the whole a tangled mass, necessitating the removal of the sprouts from their parent tubers before they can be separated out and used. As the sprouts are produced at the expense of the reserve of food material which the potatoes contain, it will be seen that the vitality of the tubers must be impaired if they are allowed to dissipate their energy in this way. Our experiments have shown that as soon as one crop of sprouts is removed another quickly follows, and that when the successive crops of sprouts are removed at short intervals the vitality of the tubers is soon exhausted.

The best way to preserve seed potatoes is to place them in cold storage at a temperature of 33 degrees to 35 degrees Fahrenheit. But few Rhodesian farmers can adopt this plan, and in consequence a number of methods of storing seed has been tried at the Salisbury Agricultural Experiment Station with a view to ascertaining which are most suited to local conditions.

Potatoes are grown at this Station as a summer crop only, and seed has therefore to be held over from the time the one crop is lifted in March or April until the following season's crop is planted—about November. It is usual for the seed obtained from this crop to begin to grow again as early as June, and with sprouts half an inch long the seed is ready for planting in July. For various reasons it is not advisable to plant as early as that, so methods of storage must aim at retarding the development of the sprouts. Our tests have proved that this is best accomplished when the following conditions are observed: (1) The tubers should be exposed to as much light as possible, though due precaution must be taken to protect them from sun-scald; (2)

Illustration No. 1.
Crop of Majestic potatoes grown at Salisbury Experiment Station. A perfect stand, the result of treating the seed tubers in the right way.
Photographed 13th January, 1927.

Illustration No. 2.

Seed potatoes stored in half petrol tins and, in background, on a rack formed of close-meshed chicken netting. Photographed 26th January, 1927.

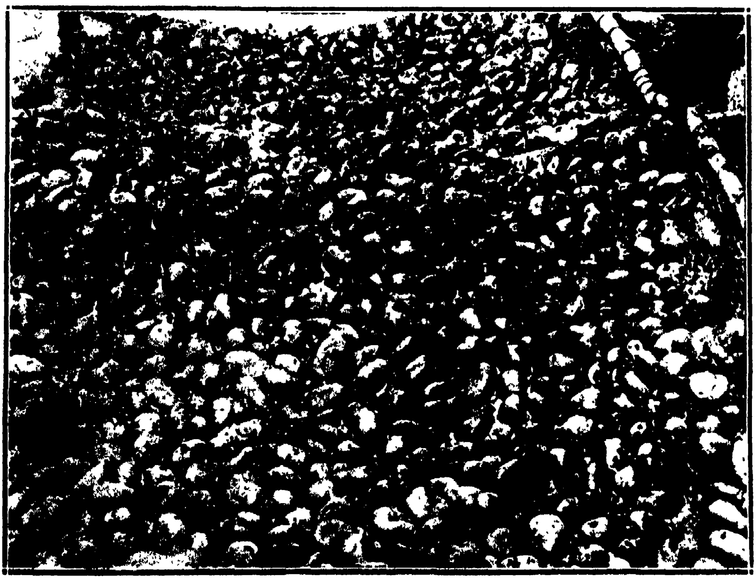


Illustration No. 3.

Close view of the seed potatoes in the rack shown in the background of Illustration No. 2.

air must circulate freely among them; (3) they must be kept cool and sheltered from rain and frost.

All these demands are easily met by spreading the potatoes in a single layer on shelves made with ½-in. wire netting, which are raised at least one foot from the ground. These should be constructed in a situation exposed to wind, but which at the same time is shaded by trees, and they should be roofed over lightly to keep off the bulk of the rain. Stored in this way, seed potatoes of the Up-to-Date variety which were lifted in April kept in good condition until the middle of the following January.

Though the tubers can be preserved in good condition for a longer period by spreading in a single layer, it is perhaps more economical to cover the shelves two or three tubers deep. Thicker coverings than this, however, are not recommended, for if the potatoes are piled too high those underneath will suffer through lack of light and air. The above method of storing seed potatoes is a very inexpensive one, for a number of shelves can be constructed under one roof, and but 10 to 12 square yards of shelving are required for enough seed, when it is spread in a double layer, to plant an acre.

If available, shallow crates of any convenient size, or petrol tins cut lengthwise and freely perforated, form suitable receptacles for storing seed, and have the advantage of being portable. They may be stacked together under a shelter designed to prevent rain from entering from above, while not excluding a maximum of light and air.

Trials were made with merely storing on the surface of the ground under the shade of trees. No advantage was gained by putting the potatoes on grass litter instead of directly on the bare ground, for they kept equally well in both cases. As soon as rain fell, however, in both cases they grew rapidly, and in a short time were useless for seed. By removing them to a dry spot and then turning them frequently, growth could have been checked, but when such means of retarding growth are resorted to the tubers are weakened through the sprouts being broken off. This method of storage, therefore, is not satisfactory, except while there is an entire absence of rain.

Another series of experiments included spreading the potatoes on the bare ground in situations exposed to the sun, but from which the tubers were protected by coverings of dry earth. These earth coverings ranged from half an inch up to nine inches in depth. It was found that half an inch of soil was sufficient protection from frost, but that a covering an inch thick was the least that would preserve the tubers from the heat of the sun during October. Coverings which exceeded two inches were found to be undesirable, for they encouraged the development of long weak shoots which are so prone to injury during planting operations. Again, although the tubers stored in this way kept fairly well during the dry weather, they started to grow freely as soon as rain fell, so this system too proved but partially successful.

Pits and cellars, though satisfactory storage places in colder countries, were found to be unsuited to local conditions in Rhodesia. A pit seven feet deep was dug, and, starting near the bottom, shelves of wire netting were fitted along the walls at intervals of about a foot apart, terminating with the uppermost one at a foot above the surface of the ground. The whole was roofed with thatch, and the potatoes were piled three or four deep on the shelves. Until the middle of August the results were equally satisfactory for all the shelves, but soon after that date the tubers on the lower shelves began to send out long weak shoots, showing that they were not receiving sufficient light. By the middle of October even those on the middle shelves had produced a tangled mass of weak shoots, many of which were ten inches long. Finally it was found that only the three uppermost shelves of this cellar were suitable for storing seed potatoes, but that potatoes for culinary purposes could have been kept sound for a few months on the lower shelves if the precaution had been taken to exclude light from them.

Tobacco farmers may utilise their barns during the winter season for storing seed potatoes, but as much light and air as possible should be admitted to them, and the layer of potatoes must not be more than two or three tubers deep if the best results are to be obtained.

Illustration No. 4.
The 7 feet deep earth cellar roofed with thatch in which it was found that the seed tubers only kept well in the three upper shelves near the light.

Illustration No. 5.
See notes in text.

A striking illustration of the retarding effect which an abundance of light and air has on potato sprouting is provided by the photographs which accompany this article. The growing crop shown in Plate No. 1 is the progeny of seed which was lifted and stored at the same time and in the same manner as the tubers shown in Plates Nos. 2 and 3, the sprouts of which had never been removed nor had the tubers been treated in any other way. The crop was planted on 15th November, 1926, and the tubers were photographed on 13th January, 1927, at which date not more than 5 per cent. were found unsuitable for seed purposes.

EXPLANATORY NOTES OF ILLUSTRATION OF SINGLE TUBERS.

Seed potatoes lifted April, 1926, photographed 1st December, 1926.

No. 1.—A degenerate tuber, which, though well preserved, has weak sprouts. Such tubers should be discarded, as they produce weak haulms which bear an inferior crop of potatoes.

No. 2.—Tuber with weak long white sprouts. The result of storing in layers five or six tubers deep.

No. 3.—A very small tuber which is in firm condition and carries a good strong sprout, showing that the size of seed tubers has little influence on their keeping properties.

No. 4.—A plump and firm tuber with short tough sprouts; the result of storing under suitable conditions.

No. 5.—A tuber from which the first-grown sprouts were removed during October. The second crop of sprouts is too numerous and the sprouts are not as strong as the first ones were.

No. 6.—This tuber was stored in a half petrol tin. (See illustration No. 2.) The main sprout is rather longer than those of No. 4, but because of the portability of the tins, the tubers can be planted from them direct, and there is no danger of the sprouts being injured.

Bulawayo Experiment Station.

ANNUAL REPORT FOR YEAR 1925-26.

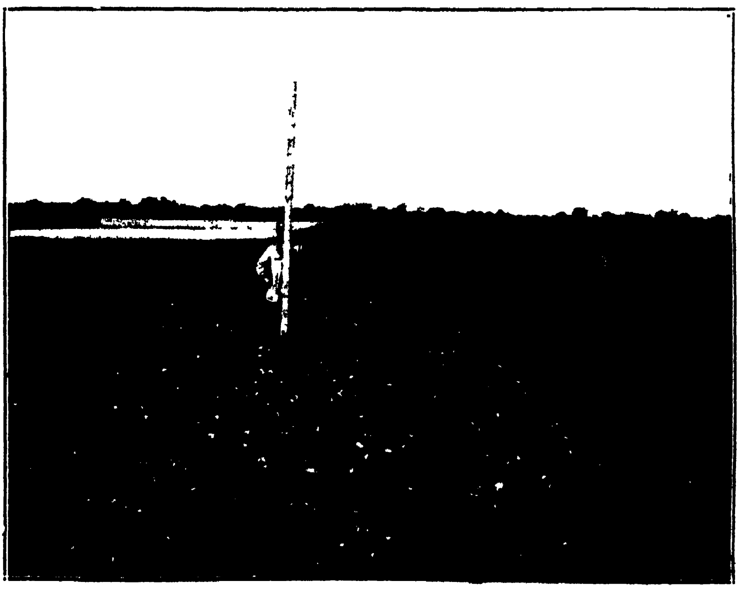
By H. W. Hilliard, Assistant Agriculturist.

The average rainfall for this station during the five years of its existence has been 28.58 ins., and two seasons have been very dry and two exceptionally wet. The precipitation during the years 1921-22 and 1923-24 amounted only to 14.5 ins., while in 1922-23 it was 33.22 ins., and in 1924-25, 45.07 ins. For the year now reported on it was nearer to the normal for Matabeleland, being 21.54 ins. The distribution was as follows:—

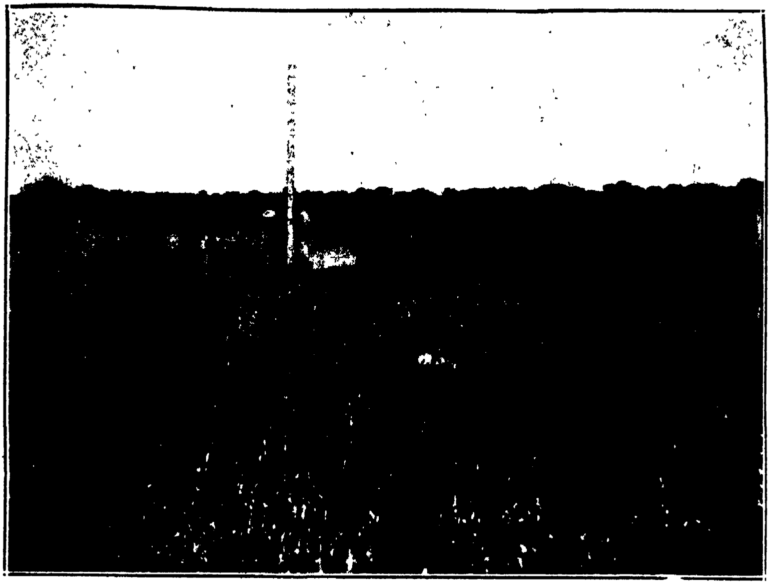
Month	No. of days on which rain fell	No. of rains exceeding ¼ inch	Total rainfall for month in inches
November ...	4	1	.53
December ...	6	2	.97
January ...	8	7	3.78
February ...	9	6	5.49
March ...	11	8	10.77
	38	24	21.54

In regard to the preliminary working of the land Mr. L. Babb, who is in charge of this station, reports:—"The land was well ploughed with a single-furrow mouldboard plough, followed by a disc harrow, and the soil was then brought to a finer tilth by means of a spiked tooth harrow. Where possible all plots received four after-cultivations."

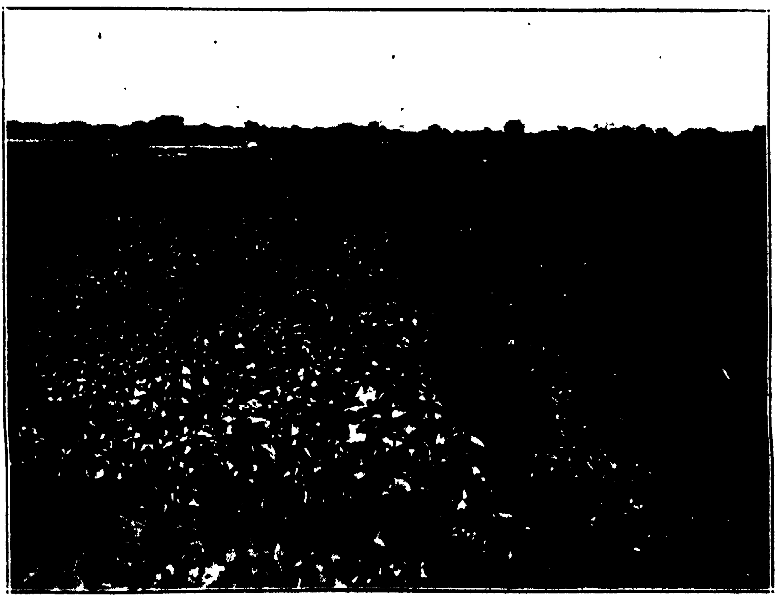
Plot 1 a.—Maize, plus seven tons of kraal manure per acre, in the first series of rotations



Plot 4 b.—Velvet beans, without manure or fertiliser.



Plot 17.—Kherson oats, without fertiliser or manure.



Sweet potatoes (Calabash) (on left) from tubers left in over the dry season. On right, planted from cuttings, 18th February, 1926.

Owing to late rains it was not possible to commence planting until 11th December, consequently some of the crops grown for seed were badly affected by early frosts in April, and this was particularly the case with the velvet beans.

Many crops also received a check due to a spell of dry weather at a critical stage of their growth, lasting from 8th January to 16th February. In spite of these drawbacks, the crops made a remarkable recovery, and on the whole very fair returns were reaped. The average yield of maize was 8½ bags per acre, and that from the best individual plot, which received seven tons of kraal manure per acre, was 15½ bags per acre.

Rotation Experiments.—In the two first established four-course rotations the land during the four years grows two crops of maize, one of velvet beans and one of Sudan grass (Series A) and oats (Series B). In Series A seven tons of kraal manure are applied every fourth year to one of the maize crops, while the beans are usually reaped for seed or fodder, and the residue ploughed in. In Series B no kraal manure is used, but the velvet bean crop is ploughed in as a green manure, and the following maize crop receives a dressing of artificial fertiliser.

SERIES A.

Crop	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Maize, plus dung	15.62 bags	13.63 bags	14.13 bags
Velvet beans	9,240 lbs. green fodder	15,244 lbs. green fodder	13,242 lbs. green fodder
Maize, after velvet beans (reaped)	9.57 bags	12.2 bags	11.54 bags
Sudan grass (first cutting) ...	5,880 lbs. green fodder	7,849 lbs. green fodder (2 seasons), 985 lbs. hay (2 seasons)	7,192 lbs. green fodder, 985 lbs. hay
,, (second cutting)	...	3,650 lbs. green fodder	3,650 lbs. green fodder

SERIES B.

Crop	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Maize, plus fertiliser (after velvet beans)	11.5 bags	15.41 bags	14.43 bags
Velvet beans	ploughed under	ploughed under	...
Maize (after oats)	10.89 bags	10.55 bags	10.63 bags
Oats	1,152 lbs. seed 4,144 lbs. green fodder	1,537 lbs. seed ...	1,408 lbs. seed 6,803 lbs. green fodder

In 1925-26 Kinvarra oat was substituted for the Kherson variety. The artificial fertiliser used on the maize was superphosphate, applied at the rate of 200 lbs. per acre.

MAIZE (CONTINUOUS).

Crop	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Maize, continuous, without manure or fertiliser	3.82 bags	7.18 bags	6.33 bags
Maize,* continuous, but with fertiliser after third year. Receives artificial fertiliser every alternate year.	11.4 ,,	...	13.5 ,,

* The treated half of this maize plot received 160 lbs. per acre of bone and superphosphate in the year 1924-25. In 1925-26 it should have received no treatment, but by error was given 100 lbs. per acre of single strength superphosphate. No fertiliser will be used in 1926-27, but in 1927-28 bone and superphosphate will again be applied.

A four-course rotation, commenced in 1922-23, consists of maize, cowpeas, maize, velvet beans. The legumes are reaped for seed or fodder, and the stubble ploughed under. The maize crops, commencing from 1924-25, received in that year 160 lbs. bone and superphosphate per acre, and in 1925-26 200 lbs. of superphosphate per acre.

SERIES C.

Crop	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Maize, after cowpeas ...	12 bags	8.31 bags	9.23 bags
Cowpeas, seed	36 lbs.	505 lbs.	348 lbs.
,, green fodder ...	4,776 ,,	...	6,532 ,,
Maize, after velvet beans ...	10.78 bags	9.65 bags	9.93 bags
Velvet beans, seed	276 lbs.	645 lbs.	522 lbs.
,, green fodder ...	5,940 ,,	...	7,527 ,,

SERIES D.

This rotation is a duplicate of Series C, but no fertiliser is applied.

Crop	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Maize, after cowpeas ...	6.22 bags	8.55 bags	7.99 bags
Cowpeas, seed	84 lbs.	303 lbs. (2 seasons)	230 lbs.
,, green fodder ...	4,236 ,,	...	6,262 ,,
Maize, after velvet beans ...	5.88 bags	8.28 bags	7.68 bags
Velvet beans, seed	168 lbs.	698 lbs.	521 lbs.
,, green fodder ...	3,192 ,,	...	6,153 ,,

MAIZE VARIETY TRIALS.

Average yield per acre of duplicate plots.

Variety	Yield per acre, 1925-26	Average yield per acre, 1922-25	Average yield per acre to date
Louisiana Hickory	9.47 bags	11.5	11.01
Salisbury White	8.44 ,,	11.2	10.53
Potchefstroom Pearl ...	8.36 ,,	11.1	10.46
Hickory King	10.44 ,,	10.9	10.83
Yellow Flint	8.38 ,,	7.0	7.39
Sahara Yellow	...	6.9	...
Golden Beauty	...	6.8	...
American White Flint ...	8.52 bags	...	...
Krug Corn	3.20 ,,	...	...

DISTANCE PLANTING TRIALS.

SPANISH BUNCH GROUND NUTS.

Planted 17th December, 1925.

Distance	Yield in lbs. per acre		
	1925-26	1924-25	1923-24
28 x 8 inches	931	...	...
24 x 8 ,, ...	...	2,264	...
30 x 8 ,, ...	...	2,128	1,332

The low yield of nuts in 1925-26 may be accounted for by the crop being planted on one of the worst plots on the station, the soil of which is very shallow and stony, and also by the lateness of planting, which affected the growth of the plants.

GROUND NUT VARIETY TRIALS.

Planted 17th December, 1925, in rows 28 x 8 ins. apart.

	Yield per acre.
Spanish Bunch	1,280 lbs.
Virginia Runner	1,064 lbs.
Japanese Bunch	960 lbs.
Jumbo	532 lbs.
Virginia Bunch	532 lbs.

YIELDS OF MISCELLANEOUS GRAIN AND FODDER CROPS.

Yield in lbs. per acre.

Crop	1925-26		Average yield per acre, 1922-25	Average yield per acre to date
	lbs.		lbs.	lbs.
Boer manna	2,416	hay	...	...
Sudan grass	4,320	green fodder	...	...
Linseed, white flowering	314	seed	352	342
Oats, Kinvarra ...	2,064	hay	...	1,396 (2 seasons)
Oats, Kherson ...	736	seed	1,030 (2 seasons)	935
Dolichos beans ...	68	,,	...	...
Cowpea, Whipporwill ...	500	,,	...	...
Sunn hemp	416	,,	...	...
Sunflower, black ...	908	,,	1,070	1,027
Kaffir corn, Jerusalem ...	12,600	green fodder	...	...
Teff grass	4,032	green fodder	...	...
Kaffir pea	4,136	green fodder	...	...
	424	seed	...	...
Niger oil	308	,,	...	...
Kaffir corn seed, bird-proof	...	...	1,093 (2 seasons)	...
Kaffir corn, white ...	...	...	756 (2 seasons)	...
Dhal	...	...	488 (2 seasons)	...
Buckwheat	170	seed	...	...

LIMING TRIALS.

Crop	Date planted	Yield per acre, 1925-26
Maize, plus ¾ ton lime per acre	19-12-25	10.82 bags
Velvet beans, plus ¾ ton lime per acre	14-12-25	6,744 lbs. green fodder, 168 lbs. seed

CONTROL PLOT.

Maize, untreated ...	29-12-25	6.86 bags
Velvet beans, untreated ...	15-12-25	4,452 lbs. green fodder, 264 lbs. seed

Although maize may generally be looked upon as the most useful all round silage crop, the following facts may be helpful in determining the best crops to grow in Matabeleland for this purpose. The normal rainfall is usually lower, and on the whole perhaps the soils are not so fertile as in Mashonaland. The sunflower is a more drought resistant crop than maize, and the following table indicates the heavier yields of sunflower and velvet beans as compared with maize and velvet beans; these two combinations over a series of years having given the best results. A wise policy would, therefore, be to grow the two combinations on separate areas; if the season is a dry one, the former should give the better yield, while if on the other hand it is a normal year, the maize combination should prove successful and will give better silage.

SILAGE CROPS.

Yield in lbs. per acre—Green Fodder.

Crop	1925-26	1922-25	Average yield to date
Maize and velvet beans, same row, 36 x 18 ins.	5,952	13,323	11,480
Maize and velvet beans, alternate rows, 20 x 18 ins.	...	13,570	13,570
Maize alone, 30 x 12 ins. ...	11,104	14,175	13,407
Sunflower and velvet beans, same row, 36 x 18 ins.	12,400	18,773	17,179
Sunflower and velvet beans, alternate rows, 20 x 18 ins.	...	16,339 (2 seasons)	16,339
Sunflower alone, 30 x 12 ins....	16,848	24,532 (1924-25)	20,690
Kaffir corn, birdproof, 30 x 9 ins.	4,960	13,021	11,005
Kaffir corn and velvet beans, same row, 36 x 9 ins.	6,572	...	6,572
Kaffir corn and velvet beans, alternate rows, 20 x 9 ins. ...	...	14,216	14,216

SWEET POTATOES ESTABLISHED FROM CUTTINGS.

Yield in lbs. per acre, 1925-26.

Variety	Date planted	Yield of tops	Date of reaping
Calabash	18-2-26	1,420	1-6-26
Early butter ...	18-2-26	1,540	1-6-26

SWEET POTATOES FROM TUBERS LEFT IN PREVIOUS YEAR.

Yield in lbs. per acre.

Variety	1925-26		Average yield, 3 reapings	
	Tubers	Tops	Tubers	Tops
Calabash	13,380	9,820	13,252	20,073
Early butter ...	19,040	10,940	15,920	13,004

RELATIVE YIELDS OF OTHER FODDER CROPS.

Other relative weights of fodder crops per acre were as follows:—

Boer manna	1,208 lbs. hay
Sudan grass	2,160 lbs. green fodder
Oats, Kinvarra	2,064 lbs. hay
Oats, Kherson	3,708 lbs. green fodder
Teff	2,016 lbs. green fodder
Kaffir corn	6,300 lbs. green fodder

The crops which failed on the station were:—

(1) Cotton on land manured with four tons of kraal manure per acre; also portion of same plot untreated.

(2) Cotton on land which received 200 lbs. bone and superphosphate per acre.

(3) Linseed (large seeded) plus three-quarters ton lime per acre.

Summary of Crop Returns.—The total production of crops in 1922-23, under a rainfall of 33.27 ins., was as follows:—

10¾ acres under maize yielded 73½ bags;

10¼ acres miscellaneous crops reaped for grain yielded 5,997 lbs. of assorted grains, oil seeds, etc.;

3¼ acres fodder crops yielded 23,334 lbs. of green fodder;

2 acres of silo crops, assorted, yielded 25,908 lbs. green fodder;

1 acre hay crops yielded 1,227 lbs. of hay;

1 acre sweet potatoes yielded 17,705 lbs. of green tops and 6,890 lbs. tubers;

1¾ acres sown to crops for ploughing under yielded nil.

In 1923-24, the rainfall being 14.54 ins., the production amounted to:—

12½ acres under maize yielded 82 bags;

7¼ acres under miscellaneous crops reaped for grain yielded 2,491 lbs.;

5½ acres under grass crops, legumes, etc., yielded 48,962 lbs. green fodder;

1¾ acres under silo crops yielded 18,615 lbs.;

1½ acres under sweet potatoes yielded 12,676 lbs. tops;

1½ acres under green manure ploughed under yielded nil.

The total production in 1924-25, with a rainfall of 45.07 ins., was as follows:—

12½ acres under maize yielded 168 bags;

8⅛ acres under miscellaneous crops reaped for grain yielded 5,353 lbs. of assorted grains, oil seeds, etc.;

5¼ acres under grasses and legumes intended for hay, but cut green, yielded 26,851 lbs. green fodder;

2 acres of assorted silage crops yielded 41,560 lbs. green fodder;

1 acre of sweet potatoes yielded 20,618 lbs. green tops and 32,580 lbs. tubers;

1⅛ acres sown to crops ploughed under for green manure yielded nil.

The total production of crops in 1925-26, under a rainfall of 21.54 ins., was:—

10¼ acres under maize yielded 78 bags;

5 acres under miscellaneous crops reaped for grain yielded 2,139 lbs. of assorted grains, oil seeds, etc.;

3¾ acres under green fodder crops yielded 18,778 lbs.;

1½ acres under hay crops yielded 3,272 lbs.;

2½ acres under silage crops yielded 24,902 lbs. green fodder;

1 acre under sweet potatoes yielded 23,720 lbs. tops;

¼ acre under sweet potatoes yielded 1,038 lbs. tubers;

1¾ acres under legumes yielded 5,165 lbs. green fodder;

2¾ acres under green manure crops ploughed under yielded nil;

1¼ acres of crops failed.

Domestic Water Supplies and Sanitation on the Farm.

(Concluded.)

By P. H. Haviland, B.Sc. (Eng.), Assistant Irrigation Engineer.

SANITATION.

On most farms the problem of sanitation is one to which far too little attention has been given, with the result that the health factor of safety is lowered to a dangerous point. The disposal of sewage in an efficient manner is important from the view of hygiene.

Sewage-borne diseases are numerous, and privies (closets), urinals, cess pools, sewage pits, manure heaps, etc., are all potential dangers. Disease may be carried by man, animals and flies. Certain members of any community may be disease carriers, although exhibiting no signs or symptoms of disease themselves, and an outbreak, the source of which would be extremely difficult to discover, may occur through such carriers. Flies will settle on any unpleasant substance and may carry disease germs away and deposit them on food. The outbreak of disease is facile and must be guarded against. The health of man is all-important to successful undertakings, and every precaution should be adopted to prevent its undermining.

The following principles should be adopted and adhered to strictly:—

1. Never allow sewage or excrements to come in contact with the food or water of human beings or live stock.
2. Never expose excrements to flies or similar germ carriers.

3. Do not make use of sewage for fertilising vegetable gardens.

4. Never discharge or throw sewage into streams or old wells or any place from which the remotest chance of drainage into streams or other sources of water supply might exist.

It will be obvious that if these vital points are considered in the planning of a sewage system the safest method of sewage disposal will result. It is an unfortunate thing, however, that the cost of installation of a really efficient sewage disposal system is somewhat high, and consequently many farmers may not be able to afford it. But there is no reason why systems better than those in general use should not be utilised. With this idea in view, various sanitary utilities will be described. In general they may be discussed under two heads: (a) privies for excrements only, and (b) works for handling all wastes where water is available for flushing.

Pit Privy.—This is the cheapest form to instal and is suitable where plenty of land is available for new sites. It cannot, however, be considered as safe, as the collections of excreta may eventually become too great for the purifying powers of the soil, and contamination of water supplies may result through the leaching of unpurified wastes. Figure XXI. shows a privy of this type. It is essential that the situation of the pit privy shall not be in wet ground or rocky formation, nor where the surface of the ground or underlying strata slope towards any source of domestic water supply. The whole structure must be made fly and mosquito-proof and the openings for ventilation and light should be covered with gauze. This privy will be essentially portable, as it will have to be moved as soon as the pit becomes full. The pit must be kept dry, and to ensure this, earth must be banked all round the bottom of the privy itself to a height of 12 inches. The pit should be shallow, not more than three feet deep, and when two-thirds full must be covered in and the privy moved to another place. A pit privy should not be closer to any source of water supply than 100 yards and must always be below it. Loose dry earth should be added to the accumulations in the pit every day, and when abandoned, earth

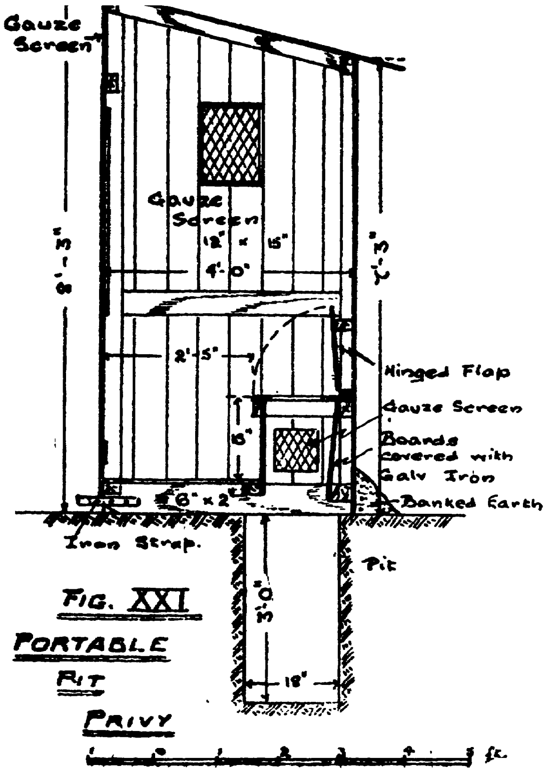


FIG. XXI

PORTABLE

PIT

PRIVY

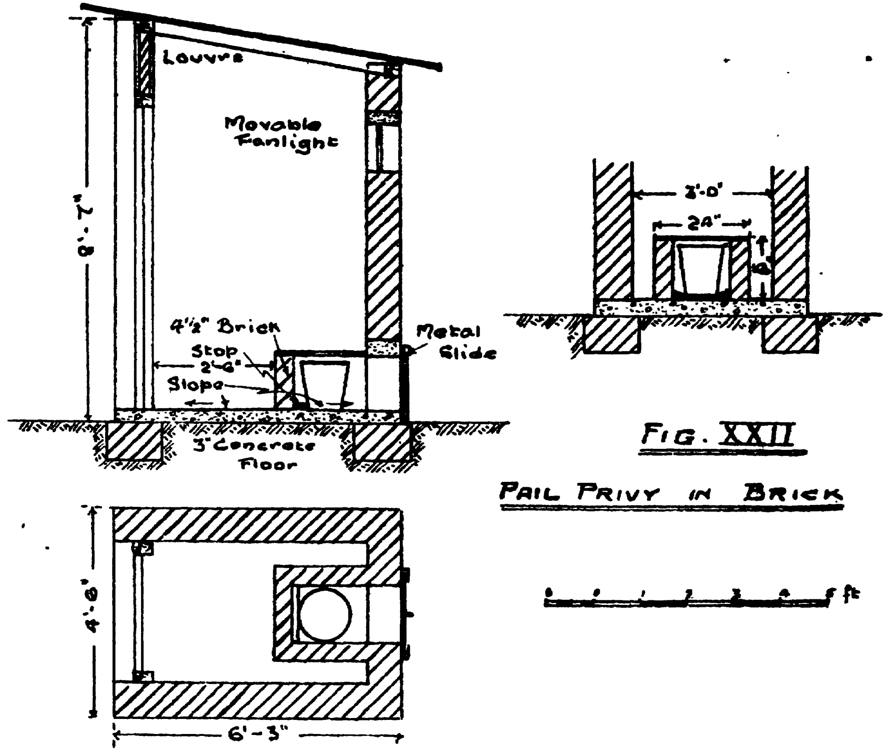


FIG. XXII

PAIL PRIVY IN BRICK

must be heaped up into a mound over the pit to prevent rain water standing there.

The seat should be made movable to permit of cleansing, and should have a separate hinged cover over the opening. Under the seat and towards the back, boards covered with galvanised iron should be set sloping inwards to prevent excreta being deposited elsewhere than in the pit. A ventilator must be provided below the seat.

The roof should project outwards for a distance of 9 inches to prevent water dripping directly on to the earth bank round the bottom of the privy.

Sanitary Privies.—This type of privy is such that the excrements are not in contact with the earth, and it is also proof against the entry of flies, rats and other vermin. The container may be movable (pail or bucket) or may be fixed as in the case of an underground metal, masonry, concrete or brick tank. The former is the usual type on the farm, and a suitable form of construction is shown in Figure XXII. The closet itself is constructed of brick, with mosquito-proofed ventilating and lighting openings. The floor should be preferably of concrete laid on a bed of well-compacted broken stone or hard brick set inside the walls of the closet. The concrete should receive a finishing coat of cement mortar floated on. The floor is best set above natural ground level and should have a slope towards the door in order that it may be efficiently cleansed. The pail space is bricked in and its floor should slope down from the front towards the back and from the sides towards the centre. A detail of this is shown. The seat, which should be hinged and have a separate hinged cover over the opening, is set over the bricked pail space sufficiently low down as just to clear the top of the pail. The pail space stands away from the sides of the closet to permit of thorough cleaning of the closet. The opening through which the bucket is removed should be closed by means of a sliding metal door fitting closely against the back of the closet. A close fit may be obtained by plastering with cement mortar.

Frequent removals of the bucket are very necessary, and it is advisable to wash out the buckets after use with some disinfectant. The buckets or pails should be made of good galvanised iron, seamless and perfectly water-tight.

The use of dry loose earth is strongly recommended. Each stool should be covered with about 1½ lbs. of dry earth immediately after each deposition. The best earth to use is a dry and moderately light loam. Sand and gravel are quite unsuitable. The use of earth is to enable bacterial action to take place, the nitrogenous matter being converted into ammonia compounds and thence to nitrates and nitrites. The night soil obtained from earth closets must be disposed of, and this may be done by burying in some locality where the danger of pollution of water supplies is not present. Night soil may be buried in a thin layer by a plough or in a shallow hand-dug trench. Should intestinal disease be known to be present, however, the contents of buckets must be destroyed by burning or rendered sterile by the use of a strong chemical disinfectant. Night soil should never be used as a surface fertiliser for vegetables or any crop where contact between the plant and excrement may lead to disease.

As regards the vault or underground water-tight container type, this will not be described in detail, but a few general hints are given. The whole should be mosquito-proofed and it must be well ventilated. If concrete is used for the vault, a mixture of 1 : 3 : 6 may be adopted and the whole interior surface plastered with a thick layer of 1 : 2 cement mortar. The seating arrangement will be similar to that described for the pit privy. The use of earth must be adopted, and this may be shovelled in at intervals through the opening from which the vault contents will be removed. This opening must have a flap or other suitable cover. Contents may be removed at fairly long intervals, depending on the size of the vault. Figure XXIII. shows a vault closet.

Chemical Closets.—As the name implies, these closets make use of chemicals to deodorise and disinfect. Whether complete disinfection takes place is a doubtful fact, and consequently the contents of the pails should be well buried. Frequent emptying is necessary. As a rule, chemical closets are manufactured in two forms: the pail and the tank. The former is very similar to the ordinary sanitary closet, a chemical being placed in the pail first. The excrements must be kept submerged. Ventilation or draught is essen-

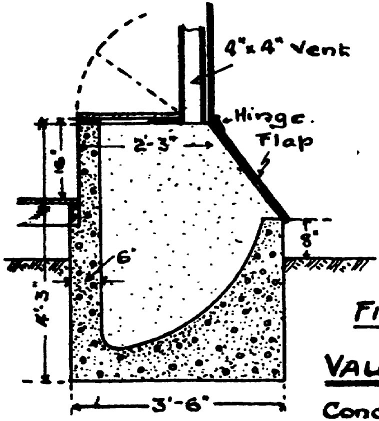


FIG. XXIII

VAULT PRIVY

Concrete 1:3:6.

1 0 1 2 3 4 ft.

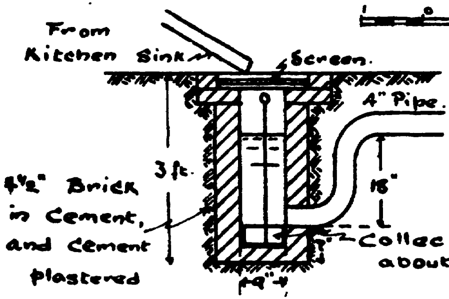


FIG. XXIV

GREASE TRAP.

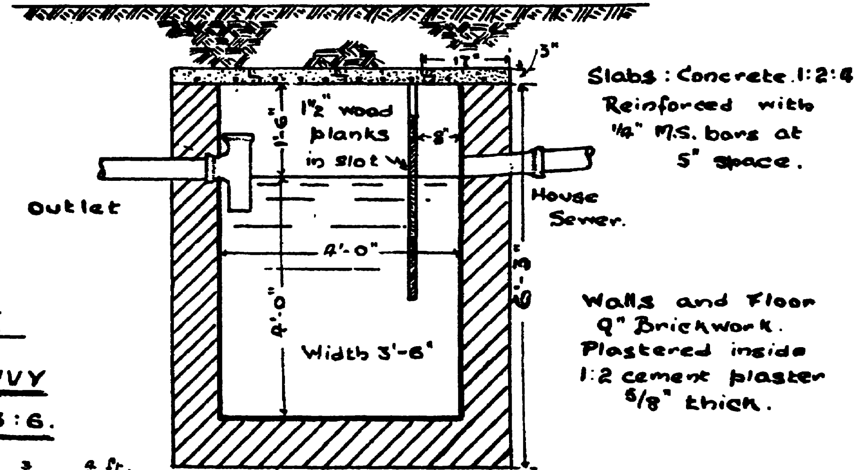


FIG. XXV

SINGLE-COMPT. SEPTIC TANK

FOR 4 PERSONS

[DRIBBLE SYSTEM]

1 0 1 2 3 4 5 ft.

tial, and this is usually effected by connecting up the closet vent pipe with a chimney or carrying it up above the top of the roof. Chemical closets are simple and compact, easily moved and of good appearance. Chemicals used are of two types as a rule: a coal tar product used to disinfect and deodorise, and a caustic solution which breaks up all the solids and which should kill all bacterial life.

The chemical tank closet is similar in operation, but the container is fixed underground. If a large tank is installed it does not require such frequent emptyings as the pail.

Septic Tanks.—These are receptacles in which sewage remains for a certain time, during which rotting or digestion takes place. The lighter solids float on top of the tank in the form of scum, and the heavier sink to the bottom, forming sludge. The sludge is retained in the bottom of the tank and is gradually converted into liquids and gases. This process is known as septicisation. It must be understood that the liquid or effluent from the tank is far from safe; in fact, it is highly dangerous, and may possibly contain more bacteria than raw sewage does. In consequence, it can never be discharged in any vicinity where pollution of water may occur. The purposes of a septic tank are to cause a partial settlement of the solids and by bacterial action ensure the destruction of organic matter. The decomposition resulting from this action is carried on in the presence of oxygen, and, after complete exhaustion of the oxygen, the action gradually ceases. The effluent from a septic tank may be more conveniently distributed than is raw sewage. Distribution originally was effected by broad flooding or furrow irrigation, but this is a method which can never be recommended to the farmer. A better method is to distribute it below the ground by means of agricultural tiles or drains laid with open joints. The effluent may also be treated by passing it through slow sand filters. This, under farm conditions, is not very suitable, as filters are usually neglected and clogging of pipes occurs. Further, unless filters are covered, great danger exists from flies. The process of filtration, to be effective, must be carried out in the presence of air, and this means intermittent doses. The whole process, although

capable of excellent results, cannot be considered other than very expensive on a farm. The sub-irrigation method of disposal will be found to be the cheapest.

Parts of System.—The system consists of four parts: (a) The house sewer from house to tank; (b) the septic tank; (c) sewer from tank to distribution area, and (d) the distribution area and system.

(a) *House Sewer.*—The length of the house sewer should not be less than 100 feet, and a greater length is better. The grade on which it is laid should be as steep as possible and continuous. Changes in grade should be avoided, as in a small system continuous flow is not possible, and cleansing of the sewer can only be effected by flushes. The grade on which the sewer should be laid depends on the diameter of the pipe. The fall in 100 feet should not be less than 2 feet for 4-inch diameter, 1½ feet for 5-inch and 1 foot for 6-inch. The sewer may be made of vitrified salt-glazed concrete or cast iron pipe. For a small household of, say, five persons the 4-inch diameter may be utilised. The jointing must be effective to prevent leakage of sewage previous to septicisation and to prevent the entry of roots of vegetation. When jointing, care must be taken to prevent the interior of the pipes from being clogged in any way with the jointing material, and swabbing must be resorted to. Obstructions occur very easily, due to rags, paper, garbage and grease. Grease traps should be placed at the outlets of baths and sinks. Figure XXIV. shows a grease trap constructed out of brick and piping. The brick is set in cement mortar (1 to 3) and plastered inside with a 1 to 2 cement plaster. At the bottom of the trap a small tin with handle attached is placed to collect silt, etc. Grease will float on top of the water in the trap and must be removed periodically. This is effected by lifting up the tin which normally rests at the bottom.

It must be noted that rain water must not be led into the sewer, but must be carried away by separate drains.

(b) *Tank.*—No hard and fast rules can be laid down for dimensions of tanks, as the quantity of sewage per head varies very considerably, but as a general guide it may be assumed that it amounts to about 35 gallons per head per diem. Sewage should remain in the tank for 48 hours at

least, and consequently a minimum capacity of 70 gallons per person should be allowed for. To keep on the safe side we will assume a capacity of 80 gallons per head. Septic tanks may be either single or double compartment and may discharge the contents after the tank is once filled by a dribble system; or alternatively, the tank once becoming filled, discharge of the whole of the contents in one flush may take place. The latter system is the better and is effected by means of an automatic and simply operating siphon, but the cost is a little more. The two-compartment tank is to be recommended, as the sludge is retained in the first compartment and remains undisturbed during the discharge of the effluent. Sludge need only be removed at long intervals—probably every two years. It is always advisable to instal a septic tank of a slightly larger size than estimated immediate requirements may necessitate, as the longer the period of septicisation, the less is the chance of offensive gases becoming noticeable. Figures XXV. and XXVI. show respectively a single-compartment tank suitable for four persons and a double-compartment tank suitable for six persons. A tank sufficiently large to deal with the sewage from a household of eight persons will require to be built to the same dimensions generally as that in Figure XXVI., but the width will have to be increased to 4 feet. Reinforcement remains the same. For any requirements above eight persons, the size may be obtained by allowing 13 cubic feet water capacity per head. If the width of the tank is increased beyond 4 feet, then additional steel reinforcement will be required in the covering slab. It is advisable to cover the whole tank with a foot of earth.

The ventilation necessary to carry off gases from the tank is effected by the inlet tees at the tank and through the house sewer and house vent. The reason for fitting submerged inlets and outlets is to prevent the scum which forms on the top of the liquid from being disturbed.

Disinfectants must never be allowed to enter a septic tank, or they will kill the bacteria which break down the organic matter and septicisation will cease.

(c) *Sewer from Tank.*—This may conveniently be a 4-inch pipe, which should be laid as carefully as the house sewer. Grade should be as uniform as possible, and the

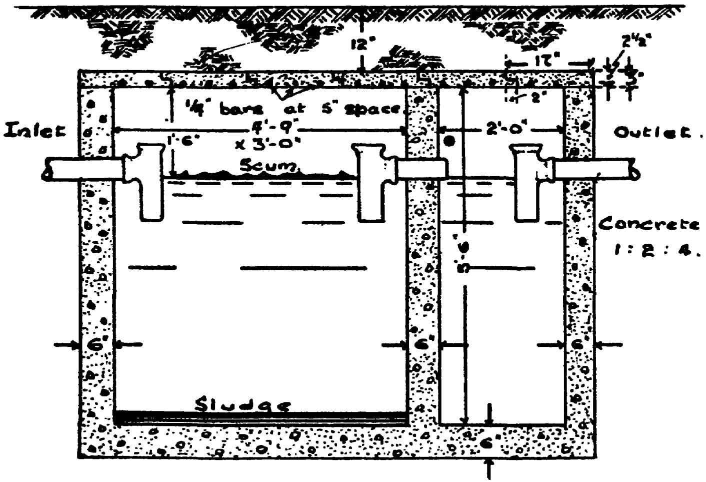
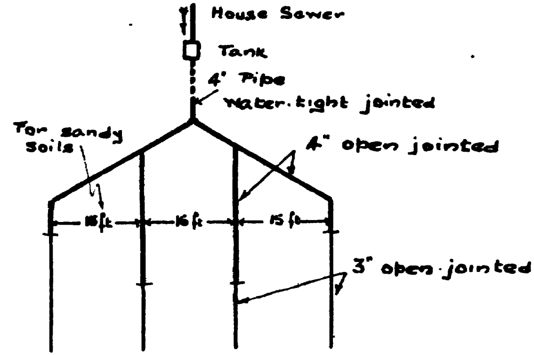


FIG. XXVI

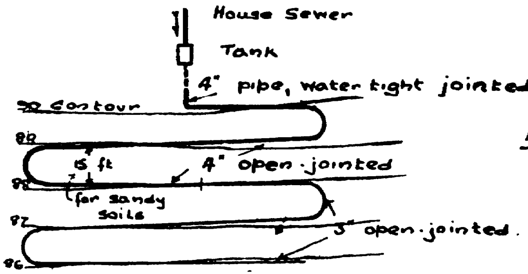
— TWO-COMPT. SEPTIC TANK —

SIZE FOR 6 PERSONS

[DRIBBLE SYSTEM]



Ⓐ Flat Slopes —



Ⓑ Steeper Slopes —

FIG. XXVII

— SEWAGE DISTRIBUTION —

whole must be well jointed and water-proof. The length will naturally vary according to the distance from the tank to the distribution area.

(d) *Distribution.*—The method of disposal of the effluent from a septic tank is the most important factor to be considered in planning the system. An efficient method of disposal means a safe and efficient system; inefficient disposal may lead to the outbreak of disease, or at least offensive odours. The method usually adopted is to distribute all the effluent about 18 inches below the surface by means of a system of open jointed pipe lines. The area of land required per head depends entirely upon the type of soil in which the distribution system is laid. The most suitable type is a dry, porous, well-drained, sandy soil, but in many localities such a soil is not available. About 200 square feet of land will be required per head in such soil and about 400 square feet in a heavy loam. In sandy soils the distribution pipes should be laid about 15 feet apart, and in heavy soils about 8 to 10 feet apart. Figure XXVII. shows two methods of laying out a distribution system. It is advisable to utilise as flat a piece of land as possible for disposal of the effluent, and the grade of the pipes in the absorption area should be about 1 in 400 or 3 inches in 100 feet. If the land is flat, system "A" may be utilised. On steep land it is necessary to adopt the lay-out "B" of Figure XXVII. This lay-out consists of a long length of piping laid on a grade of about 1 in 400, then a steep fall to the next level about 15 feet distant in sandy soils or 10 feet in heavy loam, and then back again on the flat grade. All bends in the distribution system should be made easy. Sharp bends must be avoided. The jointing is important. At the beginning of the distribution the pipes should be laid with ends as close together as possible. This should continue for about one-third of the length. For the next third the joints should be about one-eighth of an inch apart, and for the last portion one-quarter of an inch jointing should be used.

The first half of the distribution may be of 4-inch agricultural drain tiles, and the second half of 3-inch. The whole of the distribution should be laid on as even a grade as possible; if the same grade is not possible throughout,

the lengths on each particular grade should be made long. The upper portion of the piping at the joints must be covered over to prevent the entry of sand or silt into the pipes. This may conveniently be done by means of pieces of plain galvanised iron bent to a semi-circle. This is shown in Figure XXVIII. Another method is also shown in the same figure. This latter consists of tile gutter pieces and tile covers. The effluent in this case discharges from the sides of the pipes. It is advisable to cover the distributing pipes with clean gravel or stone broken to a small size.

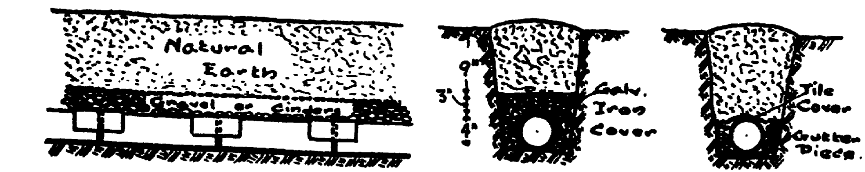
In very heavy clay soils it will be found necessary to instal a system of under-drains. This is shown in Figure XXVIII. The water draining from these under-drains must be discharged into open drains eventually, but must not be allowed to endanger any water supply. Between the effluent distributing pipe and these under-drains about 18 inches of cinders or gravel is placed.

The absorption area is best covered with a grass crop. Trees should be avoided or the roots may enter the piping, causing a breakdown of efficient working.

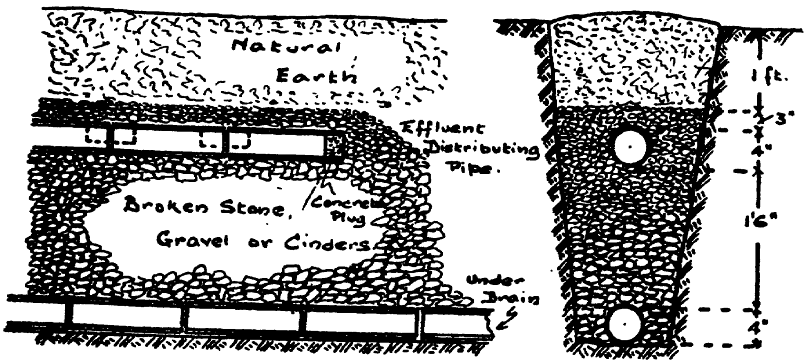
The ends of all distribution pipes must be closed with concrete plugs. This point must be adhered to strictly. The water level in the absorption area must never be less than 12 inches below the distributing pipes.

The absorption area must never be located above wells or any other source of supply, and should be distant on the lower side of such sources at least 200 feet.

French Drain.—The French drain forms a very useful method of disposing of ordinary kitchen slops and bath water, but it should not be used for the disposal of human excrements, either solid or liquid. It is easily and cheaply made, and, provided it is placed in a porous sandy soil, as a rule requires very little supervision. It is essential, however, that all liquids passed into a French drain should be free from grease and solid matter. To this end it is absolutely necessary to instal grease traps at the outlets of all sinks, baths or similar appurtenances. A ventilator should be placed in the house pipe before it enters the drain. This ventilator will carry off any gases which may accumulate in the drain. French drains should be installed some distance away from dwellings.



— Effluent Distribution —
Absorbent Soils.



Distribution [Close Soils]

Fig. XXVIII

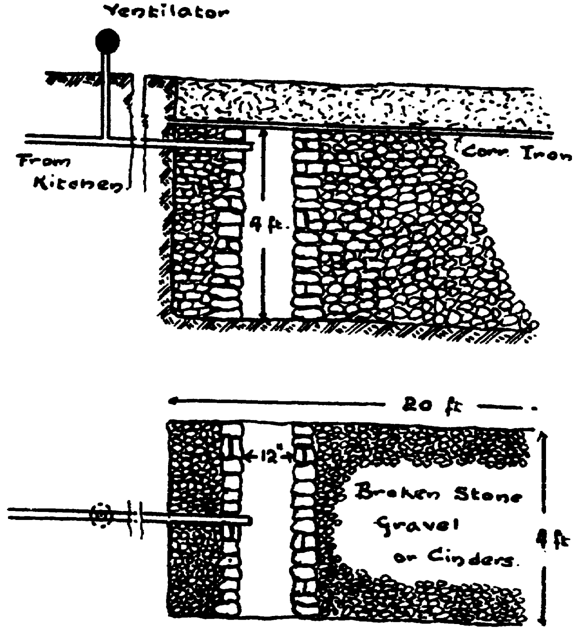


Fig. XXIX

For 4 Persons, Kitchen Waste only.

An excavation in the ground is filled with broken stone or well-burnt clinker to within a foot of the surface. It is then covered over with corrugated iron, on top of which about 12 inches of soil is placed. An opening should be left where the house pipe enters to prevent the end of the pipe from becoming choked up. The opening may be formed by placing perforated corrugated iron sheets in a vertical position and keeping them apart by means of large stones. In place of this method a small open well may be built of large stones without mortar, into which the house pipe discharges. Figure XXIX. shows a French drain of this type. The drain must be located in a well-drained soil where the water level will never rise sufficiently high to be above the level of the bed or floor of the drain. For the disposal of kitchen slops alone a drain 4 feet by 4 feet and 20 feet long should suffice in a well-drained soil. For a household of four persons a drain to dispose of bath and kitchen water should be of the same cross section, but three times as long—that is, 60 feet in length. French drains require occasional cleaning out, the periods they will operate efficiently depending entirely upon the soil conditions.

Natives.—In conclusion, it may be wise to draw the attention of the farmer to the sanitary conditions of natives employed on the farm. It is usually an exception to find that any provision for the disposal of excrements has been made in native locations on farms. Such a condition is deplorable. No employer can be certain that every native working for him is entirely free from disease. The disease carrier is a hidden menace, and consequently every step should be taken to improve conditions in order that the danger of a sudden outbreak of disease shall be as remote as possible. An unroofed pit privy is easily constructed, and every location should be supplied with these, and natives prevented from depositing excrements in open lands or bush.

The Feeding of Dairy Stock in Southern Rhodesia.

By T. HAMILTON, M.A., Dairy Expert.

A new settler often experiences some difficulty in getting a dairy herd together, and he would be wise if he took time in the selection of his stock. He will in most cases find that he will get the best bargain if he chooses grade cows of a recognised milk breed. He should use judgment and choose only those cows which have plenty of capacity, and at the same time he should keep his eye on the milk vein and udder development.

Because an animal is pure-bred or pedigreed it is no guarantee that it will be a larger producer than a good grade. In fact, many grade cows beat pedigreed cows as regards milk production. Cows vary enormously as regards their ability to give a profit, as the settler will soon find out by experience, and although it is a mere platitude to say that one good cow is worth two bad ones, it should be remembered that it is a very bad cow indeed which is not better than no cow at all.

Having got his dairy herd together, the settler should invest in a pure-bred bull whose ancestry comprises cows which have been outstanding as regards production both of milk and butter fat.

The settler, even before getting his herd together, should be certain that he can grow feed in plenty, and thus be in a position to feed his stock properly and maintain them in such a condition that they are able to do themselves justice.

Food is required for two reasons: (1) maintenance, and (2) production. Maintenance means the maintenance of life, the production of body heat and the performance of

work. The amount of food required to carry on these functions without loss or gain of weight is called the maintenance ration.

The animal normal temperature of a cow is 100 degrees Fahrenheit, and it stands to reason that in cold or wet weather larger supplies of food are required to enable the animal to maintain this temperature. Unfortunately, it is during our cold season that our supplies of food are most limited and our days are shortest; the cows under normal conditions are kraaled early and turned out late. The necessity for the provision of winter feed for our dairy stock is not sufficiently realised, and often enough our milk cows in consequence are in a deplorably emaciated condition at the end of the winter, and from this state they hardly recover before another winter is upon them.

Composition of Food.—Food is composed of the following components:—

(a) Water.
(b) Protein.
(c) Carbohydrates.
(d) Fat.
(e) Crude fibre.
(f) Ash or mineral matter.

Water.—All food contains water in some proportion, either more or less, according to the variety of food. Bran, for example,. contains approximately 10 per cent. moisture, whilst majordas contain 95 per cent. Water is necessary to equalise body temperatures and to assist digestion processes. It is present in milk to almost 87 per cent. Water supplies must, therefore, be clean and unpolluted. A fair allowance should be made, at least 12 gallons per head per day should be provided, if dairy cows are to function as heavy producers.

Protein.—This is perhaps the most valuable component of food, and in Rhodesia its deficiency in our natural pastures compels the farmer to augment the ordinary food supplies by providing such additional feeds as monkey nuts, beans and legume hay, which are rich in protein. Protein forms lean flesh and is the chief component of milk. An ample supply of protein is most essential to young growing

animals. For this reason nature provides that the "colostrum" or "beastings" should contain an excess of albumen in order to give the calf a good start in life.

It should be remembered that each gallon of normal milk contains 6¼ ozs. of protein, so that a cow giving three gallons of milk a day puts practically 1¼ lbs. of protein into the milk. At the same time it requires more than half a pound of protein for maintenance purposes; therefore a cow giving three gallons of milk per day requires almost 2 lbs. of protein per day. There is no other source from which the cow can get its protein except from the food fed to it. If the cow is a heavy milker and a deficiency of protein is present in its food, it will draw on its own body tissue and become abnormally thin and lean. Angularity and leanness, therefore, are features of most heavy milking cows, but it should be the dairyman's object to prevent undue leanness and emaciation by ensuring the provision of ample protein in the ration.

Protein has a further function of supplying energy, and in some cases manufactures fat, but feeding protein in excess is a wasteful procedure, because energy and fat can be derived from cheaper sources, e.g., from foods rich in starch and sugar. When more protein is fed than is needed to repair the tissues of the body, the surplus nitrogen is split off and excreted in the urine.

Carbohydrates.—These are utilised to give energy, to supply heat and to make fat. These, in the form of starch and sugar, compose the bulk of our Rhodesian foodstuffs. The action of the digestive juices changes starch into sugar, and as such the carbohydrates are absorbed by the body.

Fats.—All foods contain a certain proportion of these—some more and some less. For instance, monkey nuts contain as much as 40 per cent. and sunflower seed approximately 20 per cent. oil. If fed at all heavily, this proportion of oil is too great to be digested by calves and milking cows, but fattening and working oxen are able to digest this class of feed more readily. Fats are really condensed carbohydrates and are therefore more valuable, being estimated at 2¼ times the value of an equal weight of carbohydrates for heat and energy-producing purposes.

Crude Fibre.—In Rhodesia most of our bulky crops are very full of woody fibre, especially when the crop is ripe. For this reason hay should be cut early to avoid the excessive formation of the woody fibre, which is so largely indigestible. Although bulkiness of ration is of importance to the dairy cow, yet, of course, this can be over-done. The average cow cannot digest more than 70 to 80 lbs. of bulky material per day, and should more be fed, digestive troubles are bound to arise. Bulky foods such as maize silage are notoriously deficient in protein, and in order to obtain enough protein to produce 2½ gallons of milk it is calculated that the cow would be required to consume approximately 90 lbs. of ensilage, together with 90 lbs. of veld hay. This, of course, is an impossible feat. The feeding of maize ensilage is often considered sufficient for milk production, but, as will be shown later, this is erroneous, and although it may help to keep the cow in fair bodily condition, it is so deficient in protein that its use without the additional feeding of concentrates is hardly to be commended if milk production is aimed at.

Ash or Mineral Matter.—This Colony, Mashonaland particularly, is deficient as regards phosphates and lime, and the necessity of providing bone meal, together with salt, as a part of the daily mineral ration is urgent. It should be remembered that each gallon of milk contains ¼ oz. of chlorine and ½ oz. of phosphoric oxide, and that these can only be supplied in the form of salt and bone meal. A lick composed of bone meal and salt is recommended. To this may be added a small quantity of kerol or other internal disinfectant. The following is the method of preparation:—Mix a paraffin tin three-quarters full of salt with one quarter tin of bone meal; slightly damp the mixture, and add half a whisky bottle full of kerol. Mix well and stir until the whole mass is of an even colour. This lick should be placed in a trough well protected from the weather.

If it is preferred that the bone meal should be given separately, a ration of one to two ounces sprinkled on the food in the manger is of extreme advantage to milking cows and growing stock.

Milk cows should get salt every day, as it is essential to keep them in a healthy condition.

Concentrate Ration when Cows are on Grass.—When grass is green and succulent it contains large quantities of water, and it is especially necessary to give extra feed in the form of either maize meal or cake at this time in order that the cows may produce their maximum yield at the cheapest rate. Extra ration—costing, perhaps, 1d. or 1½d. per day—will enable them to produce so much extra milk that the farmer will be repaid three-fold for his outlay. In Great Britain the practice of feeding cake and meal, even though the grass is at its best, is almost universal. If this is necessary on rich British pastures, it is doubly necessary on our (at times) somewhat sparse and unsatisfactory grazing.

The average sized Rhodesian cow cannot assimilate more than approximately 80 to 90 lbs. of grass per day, and if we analyse such a quantity of grass we find that there is a deficiency in the amount of dry matter necessary for a cow producing two to three gallons of milk. This deficiency must be made up by feeding extra meal or cake in the proportions given later in this article.

As with the case of any animal, it is easy to allow the dairy cow to lose condition, but it is a most tedious process to bring it back into condition again; and for that reason when the grass is going off the necessity of giving extra feed is at once apparent, so that the animal may come through the winter in such a condition that it will immediately be able to make full use of the spring grass without wasting time in repairing and replacing body tissues.

Compounding Rations.—In compounding rations for any farm animal the following points should receive attention:—

(1) Quantity or bulk.
(2) Nutritive ratio.
(3) Palatability.
(4) Effect on the animal.
(5) Cost.

Quantity or Bulk.—A dairy cow, being a ruminant, requires a bulky ration, and its ability to transform large quantities of roughage of low protein content into a human food of high protein content makes it the most valuable

animal on the farm. As has already been pointed out, however, the bulkiness of the ration has its limits, and it is obvious that if a cow is to produce milk it must be fed concentrates in addition to its bulky rations. A good rule to remember in compounding rations for dairy stock is that 3 lbs. of succulents should be fed per 100 lbs. live weight, together with 1 lb. of dry roughage (i.e., hay) per 100 lbs. live weight. Thus a cow weighing 800 lbs. should receive approximately 24 lbs. succulents, such as silage, and 8 lbs. hay, together with concentrates varying in weight according to the animal's milk production.

Nutritive Ratio.—In utilising our farm produce for feeds, considerable difficulty is often experienced in balancing up a ration, for the simple reason that most of our feeds are rich either in carbohydrates or oil. Monkey nuts, sunflower seed and cotton seed, however, are rich in protein and are also rich in oil. If the oil is expressed, the residue known as "cake" or meal is comparatively rich in protein, and with the help of these cakes as meals very little difficulty is experienced in balancing up a ration so that the ratio between the digestible protein and the sum of the carbohydrates plus $2\frac{1}{4}$ times the fat approximates 1 to 6. Absolute mathematical exactness is not essential in compounding rations, but a ration with a narrower nutritive ratio than 1 to 5 is probably expensive, whilst a ration with a wider ratio than 1 to 8 is too carbonaceous to be used for feeding to dairy stock in milk.

Palatability.—It is extremely important that a ration should be palatable, as the palatability of the ration is an important factor in stimulating digestion and in inducing the animal to consume large quantities of food. Too often one finds mangers full of unpalatable feeds which are largely composed of woody fibre or which are mouldy. Whilst it should be one of the objects of the farmer to produce a good legume hay, yet often when such is fed to the cattle it is presented to them in such an unappetising way that they consume very little of it. By damping the dry hay with salt water and covering the next day's rations with wet sacks and allowing it to heat or ferment slightly, this bulky feed can be made so appetising that not a scrap will be left.

Variety of feed should not be overlooked. Monotony of diet is often a cause of lack of appetite, and especially with concentrates it is necessary to feed mixtures compounded of varieties of feeds. Sudden changes should be avoided, and this can be achieved if the feeds are mixed so that the substitution of one feed for another will not cause a material or marked change in the bulk of the ration which is to be fed.

Effect on the Animal.—It is conceivable that animals, like human beings, have their likes and dislikes. Where it is apparent that an animal is not thriving or has gone off its feed, it should be isolated and its rations gradually changed. Of course, unthriftiness may be due to other causes besides feed, but if kept under observation in a separate stall or loose box the reason for this unthriftiness can usually be discovered. The keeping of milk records is invaluable for ascertaining whether a cow is thriving or not, and feeding according to production can only be carried out if the milk is carefully weighed and records kept.

Cost.—This is a most important item. Every attempt should be made to feed farm produced foods only. As has already been explained, our farm produced foods are somewhat difficult to compound into a balanced ration unless monkey nuts or cotton seed are treated so as to produce cake or meals. This should, as far as possible, be done.

Legumes should also be produced and either be put into the silage pit or made into hay.

If feeds are to be purchased they should, of course, be bought in the cheapest market and due attention be paid to the cost per unit. Bran, for instance, is a good feed, but its protein content is comparatively low. Its cost per unit of protein, therefore, is high when compared with the cost per unit of protein of ground nut cake or cotton seed cake.

When estimating the cost of a ration, due allowance must be made for the fact that maize, monkey nuts and other feeds fed to cattle usually are below grade and that their commercial value is small. It is obviously unfair to charge full market prices for farm foods which it might

be difficult to sell or on which transport charges would be excessive. In this connection it should be remembered that by feeding farm produce to the dairy cow we not only get a fair monetary return, but also maintain soil fertility.

(To be concluded.)

Locust Destruction Stores.

SALE OF ARSENITE OF SODA SOLUTION.

It is notified for general information that the surplus of locust poison left over from the last campaign is for sale at a cash price of 7s. per gallon. This poison consists of a plain solution of arsenite of soda in water originally supplied to a specification of 10.5 lbs. of 80 per cent. arsenite of soda (8.4 lbs. of arsenious oxide) per gallon. It is suitable at proper dilution for cattle dipping, protection of timber and other insecticidal purposes.

Further particulars may be obtained from the Chief Entomologist, Salisbury.

Supplies are obtainable from most of the district Magistrates' offices throughout the Colony, but the amount on hand varies greatly in the different districts.

The poison will be sold without guarantee and on a strictly cash basis.

The Cost of Pumping for Irrigation.

By R. H. Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

Introduction.—Pumping for irrigation, in common with all other farming operations in South Africa and Southern Rhodesia, requires careful investigation from an £ s. d. point of view, but it is felt that such investigation may often be warranted. Where failure in such a scheme has been experienced it is frequently the case that the trouble has lain in the adoption of unsuitable plant put down without proper consideration of the factors affecting its economical use.

It is well known that, where the conditions are favourable, a gravitation scheme will prove the cheapest method of getting the water on to the land. Under such conditions pumping cannot compete with gravitation. Gravitation, however, is at a disadvantage when the river flows between deep banks, so that not only is a weir of excessive length or height required, but also trouble is met with in leading the furrow away from the river, especially when rock is encountered. Moreover, the irrigated land will be a narrow strip near the bank, and good land higher up cannot be commanded. In the case of a river flowing between high banks, it is frequently found that long reaches or pools exist; the presence of such pools is unfavourable to gravitation, but is ideal for pumping. A large natural storage is afforded, although the actual flow in dry weather may be small, and on this account the provision of artificial storage, seldom necessary for a pumping scheme, may be dispensed with altogether. In such cases it will often be found that consideration of a pumping scheme will be well repaid. The cost per acre of a pumping scheme must necessarily be greater than that of a gravitation scheme under favourable

conditions, but in many cases the proposition will still be economical, provided the soil is suitable for irrigation and capable of producing a high grade crop.

As is evident, the vital factor is one of cost, and it is necessary to ascertain beforehand whether or not it will pay to irrigate the land in question. It is hoped that by means of the information contained in this article the farmer will be enabled to determine, approximately at least, the annual cost per acre of bringing the water on to the land. Bearing in mind the wide range of conditions to be met with in practice, it can be seen that such figures apply only with certain limitations; but as these limitations will be detailed below, due allowance can be made for any variations. It is not intended to discuss the subject of pumping fully, but merely to outline the essential features as far as they affect the economics of the question.

General Conditions.—Let us now consider the type of scheme to be adopted. Its size will, in addition, of course, to being limited by the available water supply, depend on the acreage easily accessible. It is advisable not to attempt too much, as experience shows that smaller schemes (of up to 50 or 100 acres) in the hands of individuals are usually more successful. The quantity of water depends on the crop proposed, the rainfall (during the irrigation season), the nature of the soil, slope of the land and similar factors. As a basis of calculation it has been assumed that eight waterings of 3-inch depth will be applied during the irrigation season, i.e., a total depth of 2 feet over the whole land. Next it is necessary to know the rate at which the water is applied; this involves the period between successive waterings. As an average figure, a period of 15 days has been assumed, i.e., a 3-inch watering must be given to the whole acreage in 15 days. Thus the irrigation season will be one of 120 days. By a simple calculation, based on a working day of 10 hours, it is seen that this means that water must be applied for each acre at the rate of 7.57 gallons per minute. (So for 10 acres water must be pumped at 75.7 gallons per minute, and so on.) These figures must not be taken as hard and fast, but have been considered good average quantities on which to base the calculations; they are not likely to be exceeded, and under favourable

conditions less water may be applied at possibly longer periods. Storage has not been provided, as it is an expensive item; and furthermore, it is naturally cheaper to pump regularly a smaller quantity of water than a larger one at irregular intervals. Moreover, there is seldom any necessity for the provision of artificial storage where the natural conditions are favourable, as explained in the introduction.

Plant.—We have next to discuss the type of plant to be employed—that is, the pump and engine.

Pump.—For our purpose, ruling out the bucket pump on account of unsuitability, two classes may be considered: (a) Reciprocating (plunger), (b) rotary (centrifugal).

The reciprocating pump has the virtue of familiarity. It can be obtained of varied designs and in many sizes, which can be worked over a wide range of capacity. It is of simple construction. The delivery is, however, of a pulsating nature and its first cost is somewhat high.

The centrifugal pump is probably the best pump for irrigation, as it is capable of delivering large volumes in a continuous flow. Its efficiency is high. Formerly its construction was complicated and its lift was restricted, but modern design has removed these disadvantages. It is very serviceable within the limits of this article (lifts up to 100 feet). It has no valves, and consequently works efficiently with gritty water. It is simple in construction and its first cost is low. The adoption of one of these pumps has been assumed for the purposes of this article.

Motive Power.—The following sources of motive power may be considered:—

(a) Animal.

(b) Wind.

(c) Water.

(d) Oil.

(e) Steam.

(f) Gas.

(g) Electricity.

The first two and the last may be dismissed at once, the former for inadequacy and the latter for obvious reasons.

Water power is a particularly favourable type, but is too rare to figure in a general discussion. Oil, at this distance from the coast, is too expensive for continuous running. We are left, therefore, to choose between steam and gas engines. The choice of an engine will depend mainly on the local cost of fuel. Thus an oil engine, with its low first cost, might prove economical near a port with cheap oil and relatively dear timber. As between suction gas and steam, it is difficult to lay down definite figures, and local conditions must always be carefully considered. In this connection it may not be out of place to mention that timber has a definite value, even if it is the property of the irrigator and can be cut and hauled by farm labour.

Steam.—The most suitable type will be a portable engine and boiler, so that it may be employed for casual purposes when not actually used for pumping. It is economical where timber is plentiful near the site of the plant. A considerable amount of time is wasted every day in raising and maintaining steam.

Suction Gas Plant.—This type will often be found more economical and convenient than steam. The fuel is charcoal, which may be made of odds and ends of timber on the spot; cartage costs, on account of the fuel being hauled in concentrated form, are thus greatly reduced. Refuse burning plants are obtainable, but are not recommended in the smaller sizes. The time lost in starting, etc., amounts to only some 30 minutes a day. It is possible to obtain this plant in portable form in small sizes.

Cost of Pumping.—It is impossible to give absolute figures covering all cases, as the conditions met with in practice vary so considerably. Each case has its special features which influence the cost. An attempt has been made in this article to arrive at average representative figures which will give an indication of the approximate cost. This can only be done by assuming various conditions and obtaining comparative costs on this basis. The assumptions made are as follows:—

A total depth of water on the land of 24 inches in 8 waterings, on a rotation period of 15 days of 10 hours each, involving supply at the rate of 7.57 gallons per minute per acre.

Length of piping taken as 1,000 feet, and cost includes price of trenching and laying.

Cost of the plant taken f.o.r. Salisbury at current figures, and does not include cost of erection or railage from Salisbury. Formulæ have been derived to allow for variations of price with the size of the plant.

Running costs include cost of attendance and fuel. The unit is the cost of developing one horse power for one hour (horse-power-hour), and has been taken, subject to the considerations outlined above, as .75d. for suction gas and 1d. for steam. These are believed to be average values, but either or both may vary in different localities.

The cost of the scheme may be considered as of two parts: (a) Capital, or the actual cost of the plant and piping as described above. A percentage of this capital outlay is charged annually against the working of the scheme. This percentage is 7.5, including 5 per cent. for redemption and 2½ per cent. to cover repairs. (b) Operating, including attendance and fuel.

As the length of the pipe is constant, for any given height of lift the cost per acre will vary with the total acreage irrigated, as the unit cost of the plant is lower for the larger sizes. An important factor is the velocity of the water in the pipe. The greater the velocity, the greater the resistance against which the plant must pump. A lower velocity means a larger pipe, but this is offset by the reduced capital and operating costs of the plant. This effect is clearly shown in the curves. A further argument in favour of using a large pipe is that one is at least part-way prepared for further extension of the scheme.

The cost per acre per annum consists of the following:—

(a) Redemption and repairs of engine.

(b) Redemption and repairs of pump.

(c) Redemption of pipe line.

(d) Operating costs.

The figures in the tables are the total of the above for suction gas and steam, for various heights of lift and various acreages, at the most economical velocity of pumping. In addition to these annual charges, the tables show the capital cost per acre represented by (a), (b) and (c) above.

The curves given in Figs. I. and II. show the annual charges for the various conditions in a concise manner. To illustrate the use of these curves, one or two examples may be taken.

Example I.—Suppose the acreage aimed at to be 25 and that the lift required is 60 feet. Assume further that a suction gas plant is proposed and that the velocity of the water in the pipe is to be 3 feet per second. Take Fig. I. (suction gas) and enter it at the 25-acre mark at the bottom. Proceed vertically till the dotted line labelled 3 ft./sec. is reached, and then horizontally till the vertical line from 60 feet lift is encountered. This point will be found to be near the curved line marked 2.75, showing that the cost per acre per annum for this scheme will be approximately £2.75—that is, £2 15s.

Example II.—Again, suppose that the source of power chosen is steam. Fig. II. is then used. Suppose the acreage proposed is 40, and that 70 feet lift will be necessary. Enter the diagram at the bottom at the 40-acre mark and proceed vertically to meet the lower dotted line 2 ft./sec. (the most economical in this case). From this point go horizontally till the vertical line from 70 feet lift is met. This point is just below the 3.5 curved line—say, 3.4—thus the annual cost per acre will be £3 8s. approximately.

Example III.—Let us now see how the curves may be used from a different aspect. Suppose it is decided that under the existing conditions of type of soil and nature of crop proposed a water rate of £3 10s. can be afforded. The lift, moreover, is to be 60 feet and the use of a steam engine is assumed. Entering Fig. II. at the top at the 60 feet lift line, proceed downwards till the curved line marked 3.5 is met. From this point go horizontally till the dotted line labelled 2 ft./sec. is encountered; this point is found to be vertically above the 20-acre mark, as shown by the broken line. This shows that with the above conditions any acreage above 20 may be irrigated at a water rate less than £3 10s. per annum.

The above examples may be followed by the broken lines shown on the respective figures, and it is hoped will make clear the use of the curves.

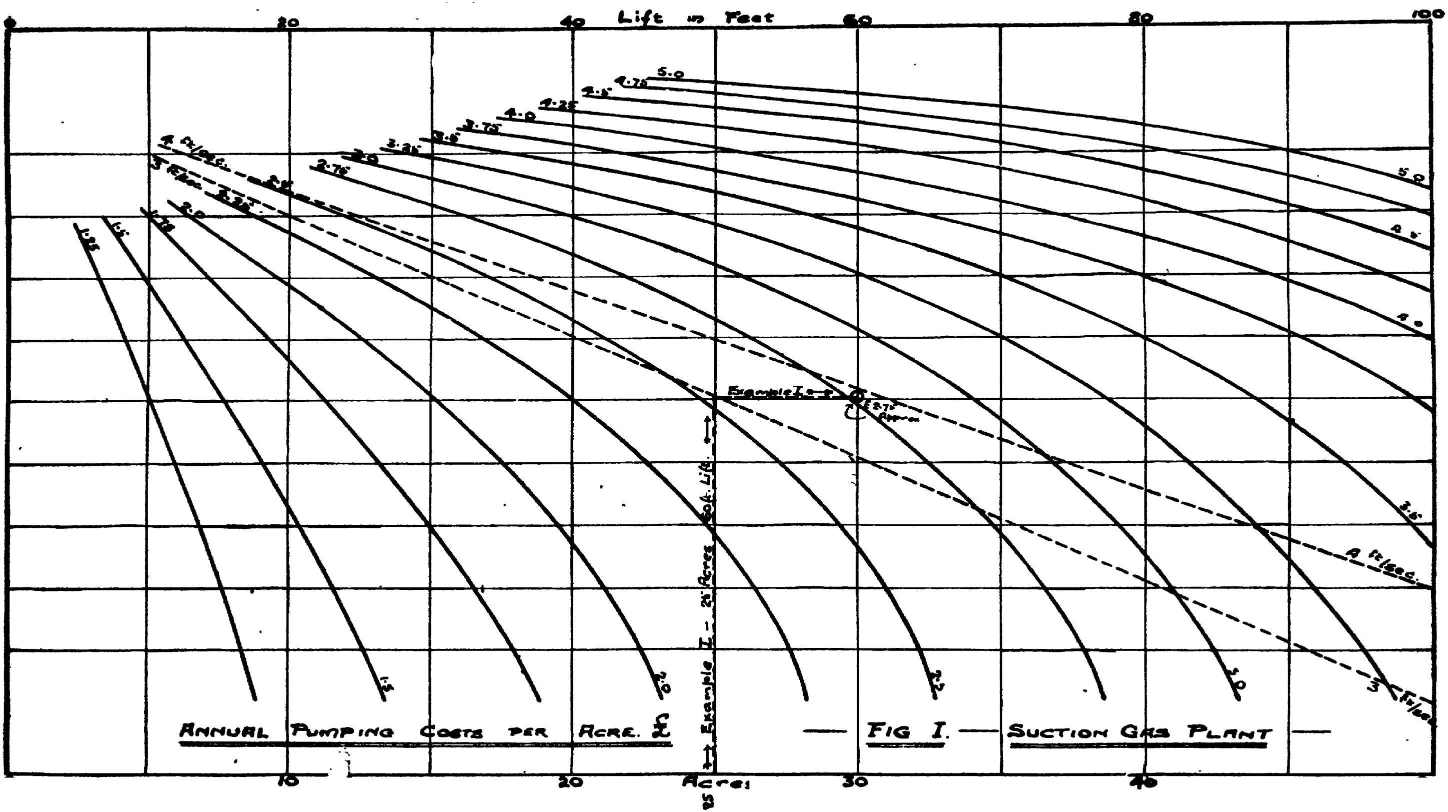


Fig I. — Suction Gas Plant

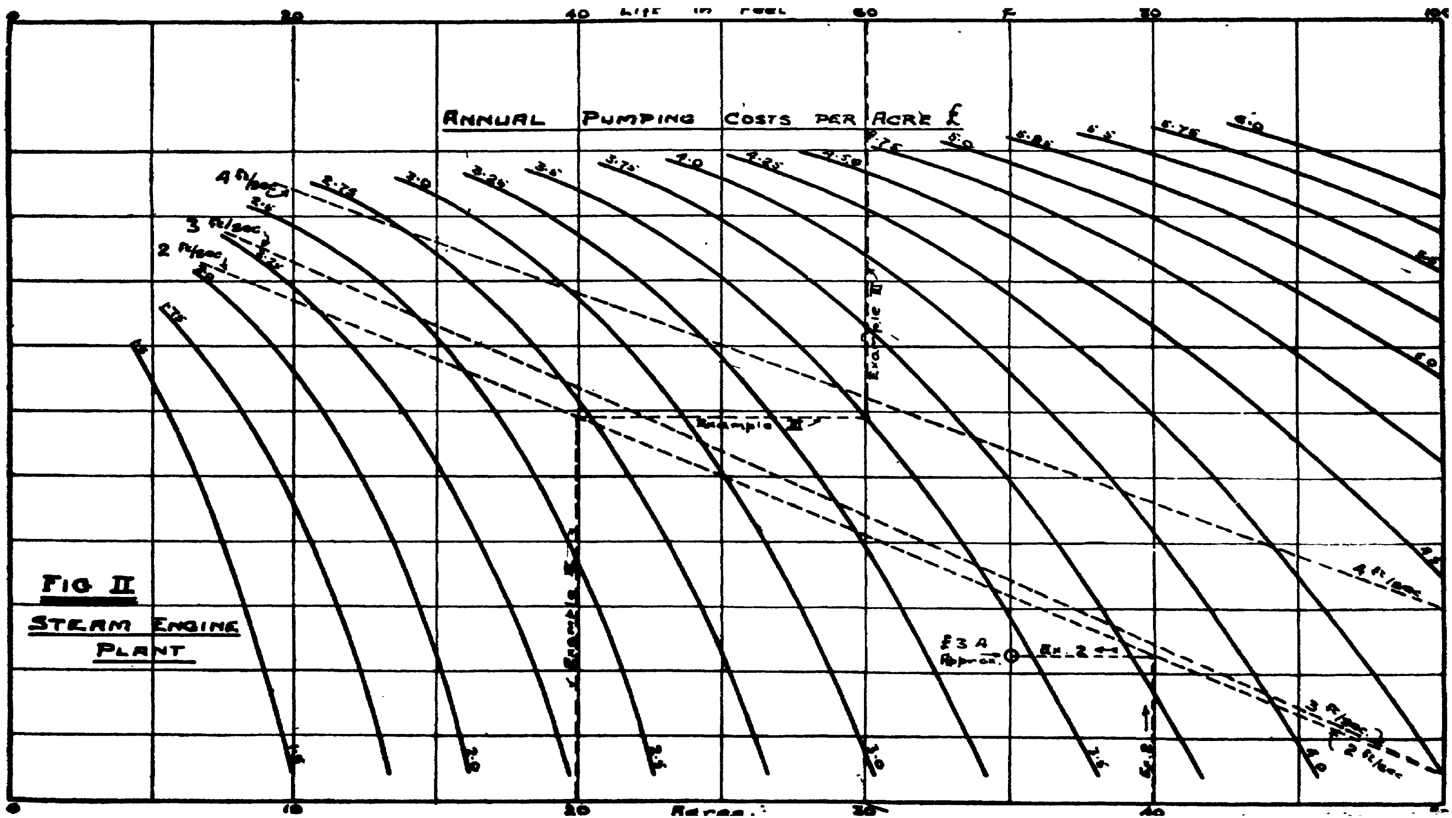


FIG II
Steam Engine Plant

In connection with the annual costs given in this article it may be of interest to quote some figures given recently in a paper entitled "Pumping as Applied to Irrigation," by C. B. Varty, read before the Association of Certificated (S.A.) Mechanical and Electrical Engineers.

	Water rate in £ per acre year	
	Fair average	Maximum
Wheat	£0.375	—
Lucerne	1.5	£2.85
Potatoes for Aug.-Nov. market	2	3.85
Out of season, i.e., winter, vegetables	3	4.80
Summer vegetables grown in close proximity to large towns	3	4.90
Tobacco	3	—
Sub-tropical fruits and oranges	4	6.25

The above figures are for the Union of South Africa. The rates quoted in the column headed "maximum" are the probable costs "taken from successful pumping plants actually installed."

Pumping schemes, as was emphasised at the beginning of this article, must always be carefully investigated before any expenditure is embarked upon; it is hoped that, by means of the tables given, the feasibility or otherwise of any average scheme may be easily checked as a preliminary step. The figures given are not intended to be of final and universal application, and each particular scheme should be carefully estimated for on its merits. The nature of the conditions assumed must always be borne in mind; thus, if a lesser depth of watering than 24 inches is required, the cost may be reduced roughly in proportion. Again, the length of the pipe line has a very large effect upon the cost.

In conclusion, thanks are due by the writer to the local representatives of Messrs. Stewarts & Lloyds and of Messrs. Johnson & Fletcher for information and costs willingly given.

PUMPING FOR IRRIGATION.

Capital cost per acre and cost per acre per annum.

TABLE I.—SUCTION GAS ENGINE PLANT. Pumping velocity 3 feet per second.

Height pumped in feet	10 acres		20 acres		30 acres		40 acres		50 acres	
	Capital cost per acre £	Annual cost per acre £	Capital cost per acre £	Annual cost per acre £	Capital cost per acre £	Annual cost per acre £	Capital cost per acre £	Annual cost per acre £	Capital cost per acre £	Annual cost per acre £
20	28.0	2.30	21.8	1.86	17.5	1.55	15.4	1.41	13.8	1.31
40	31.85	2.95	24.3	2.43	20.3	2.12	17.9	1.95	16.2	1.84
60	35.4	3.58	27.1	2.97	22.7	2.66	20.1	2.48	18.3	2.35
80	38.4	4.17	29.5	3.51	25.0	3.19	22.1	2.97	20.2	2.85
100	41.2	4.74	31.9	4.05	27.0	3.70	23.9	3.48	22.0	3.35

TABLE II.—STEAM ENGINE PLANT. Pumping velocity 2 feet per second.

20	26.9	2.20	21.3	1.85	17.8	1.67	16.4	1.56	15.1	1.48
40	30.4	3.01	25.0	2.67	21.5	2.50	19.1	2.33	18.8	2.24
60	34.2	3.84	28.7	3.50	23.8	3.23	22.4	3.12	20.6	2.93
80	37.8	4.66	30.4	4.18	26.9	4.01	23.7	3.77	23.4	3.69
100	41.6	5.51	33.7	4.98	27.8	4.63	26.5	4.53	23.8	4.27

Soil Erosion.

We publish below a letter from a correspondent in which the writer takes exception to a statement contained in a review by an officer of the Irrigation Department of the report of the Kalahari Reconnaissance. We also publish the views of the Irrigation Branch on the point raised as expressed by Mr. P. H. Haviland, B.Sc. (Eng.), and in doing so would express the hope that the controversy will help to focus attention on what is one of the most serious problems before the Colony to-day. Soil erosion has formed the subject of many articles in this Journal, *and in season and out of season the evils of the uninterrupted washing away of the soil have been stressed. Remedial measures have been suggested by the Irrigation Branch, and it is pleasing to note that in many instances the advice tendered has been put into practice with successful results. There are many farmers, however, who apparently fail to realise the seriousness of the position and make no provision for the protection of their lands. We would urge them before irreparable damage has been done to seek the advice of those well qualified to assist them, and to take early measures to minimise the consequences of the torrential downpours to which this Colony is subject.*— Ed., *R.A.J.*

"The *Rhodesia Agricultural Journal* is widely read beyond our borders, and, being published by Government authority, articles appearing in it are read with corresponding respect. Therefore the writer of an article should not make such a misleading and sweeping statement as that on p. 84 of your January issue, where it is stated 'veld erosion is due to the clearing or tramping down of vegetation and is the natural result of the thoughtless and undirected activities of the white settler.' It seems as if the writer of this assertion had never heard of the native agriculturist or as if he approved of the latter's methods.

"The case is correctly put in the *Farmers' Weekly*, 19th January, p. 1862, 'Three white men in every five, and

every black man on the land, have much to do with the constant change of the soil. All the blacks and the three Europeans out of the five mentioned above are responsible for changing the soil in the wrong direction. They are robbers —soil robbers.'

"Three out of five may be a conservative estimate, but whatever the damage done by the whites, it is infinitesimal compared with that done by the native agriculturists, who, by paying £1 hut tax—the £1 paid for rent does not seem required now—can pick the eyes out of a four mile radius, and when, later on, the ground is required for ordered European occupation the river bottoms are found scoured, and what were once sheltered water-holes are found to be mud puddles with armless stumps standing round about them. When, then, some unfortunate settler tries to patch up these wounds on God's good soil, which he seldom succeeds in, he is debited with being the cause of them by those who know no better.

"Unfortunately, sir, no Government, nothing will ever be able to control soil erosion, because it is all part of one great problem. Years ago in the old *Cape Journal* the conservator of forests stated that as the Basuto nation increased, and with its herds and flocks carried the erosion further up the Maluti mountains, so the flood water level of the Vaal and Orange Rivers decreased.—A.G."

Mr. P. H. Haviland, B.Sc. (Eng.), Assistant Irrigation Engineer, submits the following:—

"The complete statement to which 'A.G.' takes exception is, 'Veld erosion is due to the clearing or tramping down of vegetation, and is the natural result of the thoughtless and undirected activities of the white settler.'

"This statement is correct, although 'A.G.' considers that it is not complete. That a vast amount of damage is done by the native is certainly appreciated; but as this *Journal* is published for and read by the European farmer, that no reference was made to the ravages wrought by native agricultural methods does not appear to be a very important point, particularly as the above remark on erosion was only incidental to the article in question.

"A brief survey of the position may be enlightening. As regards cultivated lands, there are to-day approximately 1,200,000 acres of land under cultivation by the native and only about 348,000 acres cultivated by the white settler. On the face of it, one might be led to believe that the natives as a community at the present time would therefore be responsible for a greater total amount of erosion than white settlers. Whether this is so or not depends entirely upon what the relative amounts of erosion per acre caused by the unthinking white settler and the native are. These relative amounts can only be decided upon by an examination of the methods employed in crop raising by each, and by an investigation of the localities in which the agricultural operations are carried out.

"Let us examine the latter first. The best lands in this country to-day are occupied, or will be occupied, by white settlers. The soils on these lands, apart from certain districts where tobacco is grown, consist in the main of loams varying from a light to a heavy nature, depending upon the percentage of clay present. On such soils crops are raised annually, the system adopted being one of intensive cultivation. That is, the same land is cropped every year, not necessarily with the same crop, however, and is also fertilised to replace such constituents as may be necessary to the successful propagation of crops. Clean cultivation is practised, and deep or fairly deep ploughing carried out. In this way there is practically no protection afforded against soil washing unless the methods advocated by this Department are carried out. The storm water entering on lands and the actual rain falling on the lands wash away the loosened soil on the surface and gullies eventually make their appearance. Ploughing up and down the slopes is practised by many farmers, and this aids very considerably in the formation of gullies.

"The native agriculturist as a rule chooses a poor type of soil to work, on account of the ease with which he can break up and till such ground, and on this account he is not able to grow crops for more than perhaps two years on the same piece of land. He then clears new ground and allows the old land to lie fallow. During the period of fallowing, weeds and grass take possession of the untenanted soil and form a protection against erosion. The native's operations

are essentially of an extensive nature. Further than this, clean cultivation is, at the present time, not generally practised, and weeds and grass are allowed to grow almost unchecked together with the crop which is being grown. Thus even while crops are growing a certain amount of protection, admittedly of the wrong kind, is afforded against erosion. Stumping must also be considered. In efficient methods of agriculture stumping is necessary. The native, however, in his usual way indulges in more slipshod methods, and merely cuts the tree, leaving a stump standing and the roots still in the ground. The roots bind the soil to a great extent, and in this way soil washing is also retarded. Another point to be considered is that the native does not carry out deep ploughing.

"Against these facts, however, we have to consider the much greater acreage of land which is broken up by the native in his extensive farming operations; but in this connection it must be realised that the amount of land to which he has access is limited, and consequently he is not able to extend indefinitely. Undoubtedly erosion due to native agricultural methods will increase very considerably as the areas occupied by him become thickly populated; but this is not the present position.

"On comparing the damage caused by the white settler and by the native, that is the relative damage due to intensive and extensive methods of farming, another important question arises. What is the proportion of damage caused in the first two or three years after cultivation starts, compared with the total amount in, say, five years? Exact figures cannot be advanced, but it would appear from observation and from information elicited from various farmers in this country, that erosion does not take place on an arithmetic, but on a geometric progression. That is, the erosion occurring in the second year is more, as a proportion of the whole, than that in the first; in the third, more than in the second, and so on. The most disastrous form of erosion (gulleying) occurs usually only after several years of cultivation.

"With regard to the erosion on non-cultivated lands, this occurs as a result of over-stocking, and over-stocking is dependent not only upon the type of country, but also upon climatic conditions. The native is an offender in the use of

the sledge; and the white settler very often in faulty road construction. Bush cutting and veld burning are both causes of erosion, and as regards the latter, the native is usually more to blame.

"The statement from the *Farmers' Weekly* that 'three white men in every five and every black man' are responsible for soil erosion is not correct as regards this country. Certainly every native may be assumed to be responsible for an amount of erosion, but from figures available it appears that the proportion of white settlers responsible for erosion in this country is nearer twenty-five in every twenty-six, than three in every five.

"As regards the ill effects due to the native agriculturist, it is a very significant fact that there was no pronounced evidence of erosion in this country previous to the European occupation. In this connection it is also recognised that there are streams, originally perennial, which to-day are only storm water courses, and others which have a smaller low season flow than they had thirty years ago.

"The subject of soil erosion in the Union of South Africa was investigated very fully by the Drought Investigation Commission a few years ago, and two short extracts from the report are given:—

" 'Your Commissioners are convinced from the evidence submitted that, as a result of conditions created by the white civilisation in South Africa, the power of the surface of the land as a whole to hold up and absorb water has been diminished.'

" 'The diminished capacity of the country to hold up and utilise the rain which falls has been caused by the deterioration of its protecting vegetal cover and by soil erosion.'

"The preceding is an endeavour to put as briefly and clearly as possible the position of affairs as regards soil erosion, due to the white settlers' and the natives' operations, which exists at the present time in this country. As regards the future, it is a gratifying thing to see that the white farmer is now, in increasing numbers every year, taking the necessary steps to reduce the amount of erosion, and this will doubtless have a beneficial effect on native agricultural operations, since the results of the work of the white man are bound to be to a great extent of educational value to the black.

" 'A.G.'s' statement that 'no Government, nothing will ever be able to control soil erosion, because it is part of one great problem,' is without any foundation. Erosion is being controlled by Governments in many parts of the world, and the Government of Southern Rhodesia, through this Department, has done and is doing a great deal in this direction. If the precautions advocated by this Department are attended to, soil erosion will be very greatly reduced. Advice on the subject is always available and readily given.

"The following extract from the annual report of the Chief Native Commissioner for the year 1925 is enlightening:—

" 'An interesting defence of native agriculture is submitted by the Native Commissioner, Mrewa, who, while deprecating the careless and inefficient use of ploughs, observes that the best results during the last season were obtained from newly "ridged" land, prepared by hoe, on which the ridges stood above the water.

" '*The lands having been newly prepared, the trees and stumps still stood with a certain amount of unburnt brushwood, and this prevented the washing away of ground.*

" '*We are too often given to condemn the native method of agriculture . . . if trying to produce a crop with the least element of risk or failure can be called indolence, then we are all equally guilty.*' "

Barley.

By P. V. Samuels.

Barley is now an established crop in Rhodesia. It has been proved that wherever there is sufficient water to grow a winter crop, barley can be grown to advantage. In 1920 the South African Breweries, Limited, introduced this grain to the notice of the farmers; it is true that previously small acreages had been grown for grain and to some extent for green forage, but the want of a market had prevented any real practical trial being made. The seed introduced was ordinary Cape seed of the six-row variety, and this proved quite suitable to our soil and climate, being a fairly good cropper and comparatively resistant to fungoid diseases. The matter, however, was not allowed to rest there; with the object of finding out if the right variety was being grown, seed was imported from Chili, California and North Africa.

In the absence of an experiment station with irrigation facilities where these different varieties could be tested, it is difficult to determine whether they are more suitable to our conditions of soil and climate than Cape seed. One variety, viz., Mariout, certainly gave promise of being a heavier cropper, but without exact data this remains unproved. From 1920 until now there has been steady progress; some years proved disappointing from the amount offered for sale, but in no instance has the barley crop failed. In 1926 the Castle Brewery advertised their offer of 20s. per 150 lbs. delivered at the Brewery, for all grain that was suitable for their use. This offer has now been extended to cover the next two seasons' crops.

The purchases made last year, as a result of their offer, were very gratifying, the quality was good and the quantity was a little more than one-third of what is required within the territory.

The crop is collected at Salisbury, railed to Union malthouses, and after it has been made into malt is returned here. This, of course, is only a temporary expedient to cover the period until the amount of barley grown is sufficient to warrant the erection of a plant to deal with it at Salisbury. Now that there is an assured market at a definite price which has been stabilised for two years, barley is a very attractive crop. There appear to be few cultural difficulties to overcome; in some cases birds attacked the ripening grain and late frosts did a certain amount of damage, but on the whole barley is a crop comparatively hardy and free from pests. The yield in 1926 varied from 15 to 8 bags per acre on irrigated land. No trials have been made as to the best method of fertilisation; one grower obtained good results from a dressing of 200 lbs. per acre of bone and superphosphate; others used kraal manure with fair results. This is a matter that awaits investigation. The time of planting to a certain extent depends upon the rains, but it has been amply proved that early sown barley yields better than the late planting. From the 15th April to 15th May appears to be the best time, but here again there is need for more definite information.

It may be of interest briefly to describe the process of making malt.

The barley is first cleaned, and as far as possible freed from all other seeds; it is then steeped in water, which is frequently changed. After the grain has absorbed as much water as it is capable of doing and has become quite soft, it is either spread out in a thin layer, or placed in germinating drums to grow. Growing continues for several days, and is continued until the plumule or rudimentary stalk has grown about half way up the grain. When the growth is sufficiently advanced the drying process is commenced; this is accomplished by heaping the grain on a kiln through which hot air is passed. The character of the original barley is considerably changed by this process; the starchy portion becomes much less hard, a considerable amount of malt sugar is formed and certain bodies necessary to all growing plants are formed and remain in the malt.

From the foregoing outline of the process it may be gathered that for barley to be of suitable quality for malting it must conform to certain standards.

Briefly the maltster requires:—

(a) That the barley shall be fully ripe before it is harvested.

(b) It must be free from smut.

(c) There should be no discoloured corns (due to heating in stack or exposure to damp).

(d) Clipped or half corns should be absent (these are caused by too close threshing).

(e) The sample should be plump, even in size, of a good straw colour, and contain no other seeds or foreign matter.

To arrive at this standard, the grower must use good seed, and this must be treated either by formalin or copper sulphate to eliminate smut.

The soil must be well tilled and fertilised so as to bring the growing plant to maturity without undue delay. The crop must not be harvested until all trace of green has left the straw and the corns themselves have a slightly wrinkled appearance. The threshing should be done as soon as convenient, care being taken not to clip the awn too short. Finally, the grain must be cleaned and graded through a winnower so as to give a uniform bulk. In other respects the culture of barley differs but little from that of wheat.

With regard to the damage done by birds, there seems to be no other way of counteracting this except by the use of poisoned bait. The following method of preparing and using the bait was published by the Potchefstroom School of Agriculture:—

"Obtain from the chemist an ounce of powdered strychnine alkaloid. Take two cupfuls of dry laundry starch or three large cupfuls of wheat flour, mix it with a little cold water, then add enough boiling water to make one-half gallon (three bottles) of paste and cook for a few minutes until the paste is clear, stirring continually. Then stir in the strychnine powder. Pour the poison paste over 40 to 50 lbs. of small grain, such as kaffir corn, mix thoroughly so that every kernel of the grain is coated with the paste. Then spread the grain out and let it dry. After being dried it can be kept indefinitely and used when desired. Fifty pounds is enough bait to last for a long time. Burn small

patches of ground and scatter unpoisoned grain on these. After it is found that this grain has been eaten the poisoned grain can be used. The patches of ground should be some distance from the house, otherwise the poultry may be killed. Great care should be used in handling strychnine. It is very poisonous and dangerous, and a very small dose will kill a man."

Tenders.

Tenders are hereby invited for the purchase of approximately 4,915 gallons of concentrated arsenite of soda solution at Bulawayo and approximately 887½ gallons of a similar solution at Salisbury.

This material consists of a plain solution of arsenite of soda in water originally supplied to a specification of 10.5 lbs. of 80 per cent. arsenite of soda (or 8.4 lbs. of arsenious oxide) per gallon. It is suitable at proper dilution for cattle dipping, protection of timber and other insecticidal purposes.

Further particulars may be obtained from the Chief Entomologist, Salisbury.

Tenders for smaller quantities will be considered.

Tenders should be addressed to the Secretary, Department of Agriculture, Salisbury.

Poultry Husbandry.

OVARIAN TROUBLES.

By A. Little, Poultry Expert.

Practically all ovarian troubles among poultry are the result of an over-fatty condition of the body generally and of the abdomen in particular; either too great an accumulation of fat is present at the period that the ovarian trouble is manifest or it has been present previously and caused the trouble and then gradually disappeared.

If, on handling a bird, fat is felt inside the abdomen and it is difficult to feel the gizzard, and the pelvic bones are found to be covered with fat, the bird is then too fat to be in good laying condition, i.e., to shell out eggs rapidly and constantly as she should.

The laying of an egg is not the simple process many imagine; to do so without risk, a bird must be in the best of health and condition. She must be as hard as nails and lean. With the record laying hens we have at the present day, it is therefore imperative that they should be strong and healthy, for every time a hen lays an egg she risks her life. At one time a hen laid about 20 eggs per year; nowadays many lay 300 eggs and over per year. Naturally, the strain of doing so is very severe. When a female chick is hatched she has in her ovary hundreds of very minute ova, which in time develop and are produced as shelled eggs. It is the business of the egg farmer to treat the bird as an egg machine and to get as many of these eggs produced as possible, and in as short a time as possible; therefore he must also see that the hen is kept in the best possible working order. In the days that the fowl laid 20 eggs or so per year, she still had in the ovary large numbers of undeveloped eggs as she has now; those

that became partly developed but were not laid she used as food, their contents being absorbed into the body. Therefore it stands to reason that the bird laying, say, 300 eggs in the year does not derive the same nourishment from the inlaid eggs, and requires extra food of the right sort to nourish her system and to sustain her in health, vigour and vitality. This, however, can be overdone by giving her too much food, or, what is more usually the case, giving her foods which contain too much fat in proportion to protein. Most of the former is stored up in the abdomen around her reproductive organs, so making still greater the risk she runs of losing her life every time she lays an egg.

To make my meaning clearer it is necessary to explain the position of a hen's reproductive organs and mechanism and the method employed in producing eggs.

The ovary and oviduct are found in the abdomen. Each ovum when fully developed is, of course, of the size of an ordinary yolk; the undeveloped ones are of various sizes, ranging from that of a pin head and smaller to almost the size of an ordinary yolk. There is also the oviduct, which is 2 feet long; in addition to these organs there are in the abdomen the intestines 6 feet long, the gizzard, the kidneys, spleen, peritoneum and a large amount of tissue, blood vessels, nerves, etc. Thus it will be realised how packed the abdomen is; especially is this so in a bird which is short and narrow in body and lacks depth.

The body of the bird should be long, broad and deep if she is to lay well and produce eggs without much effort, for these must have plenty of room to develop and pass down the oviduct comfortably and quickly. Now if the abdomen of the bird, in addition to all these organs, contains much fat, it can be easily realised that the eggs have a still less chance of developing properly and the risk to the hen of something going wrong with her reproductive organs is even still greater, and this is one of the chief causes of rupture of an ovum and subsequent death. There is certainly no room for excessive internal fat.

In a fat fowl the fat covers the kidneys, which lie on the top of the ovary and oviduct. While there is fat below these latter, forming a sandwich, what chance then have these organs of functioning properly?

The manufacture of eggs is quite mechanical, given the wherewithal—that is, proper food, housing and treatment—to make them. A hen in laying condition, with ovary and oviduct free from fat, must continue delivering the eggs. The more she lays the more eggs there are to ripen and follow those gone before. When one yolk is going down the oviduct the next one ripens and takes its place in the ovary. As the egg is shelled and laid, the next yolk is fully ripe and drops into the oviduct, and so on. It will thus be seen that laying is mechanical and like clockwork if the owner of the bird treats it properly and has handled and examined it for capability.

It is also obvious that the quicker the shelled eggs come out, the sooner does the next yolk ripen and drop into the oviduct. If there is an accumulation of fat round the oviduct, especially the lower part, there will be a hold up of the egg, and thus two or three eggs a week only may be laid where four or six would have been if the fat was not present. In fact, the result might be and is often worse than this, for the second yolk, while waiting its turn, may become over-ripe, burst its case and drop into the abdomen instead of the oviduct, and peritonitis and death ensue. In some cases the yolk is absorbed or sucked back; this is fortunate for the fowl, for it precludes the danger of it bursting into the abdomen; but still, it is an egg lost to the owner. It will thus be seen that, given capability and capacity for laying, a fowl properly treated should give its owner an egg every day throughout the year; therefore it is up to him, if he wants a maximum of eggs, to handle his birds carefully, keep only those he finds have the highest capacity and capability, and treat them properly. The record up to date is 352 eggs in 365 days.

It is very simple for the best layers to die. For instance, an abnormally large egg and the straining to expel it will cause irritation and inflammation of the oviduct, and subsequently death. Or a cyst or cysts will be found, again ultimately causing death (see illustration No. 1); or the large egg will touch the ripe or large yolks in the ovary and cause them to stop functioning. The yolk in them will then be absorbed, the small yolks will also dry up, and the ovary become dormant for a time.

One of the reasons why a bird should be long in the back is that it minimises the chance of the egg, when it is being covered with shell in the lower part of the oviduct, touching the ovary; further, it precludes the gizzard, if covered with fat, interfering with the expulsion of the egg. In short-backed birds both of these accidents are very likely to happen. An egg can thus be held up in the oviduct for days and weeks, and when laid is naturally anything but fresh; and this is the explanation of some "new laid" eggs being quite stale. All eggs should be tested before being sold. The oviduct may be twisted at some part of its length; the succession of yolks coming down will stop at this point and form a large mass, until finally the irritation caused by them in the oviduct affects the upper opening, and the yolks, instead of dropping into the oviduct, drop into the abdomen (see illustration No. 1). Other yolks in the ovary as they ripened would have done the same. In this case the envelope covering the yolk was strong and in good condition, due to the vigour and stamina of the bird itself; but in another bird with less stamina the envelope would be thin and easily tear; the result would have been that the egg yolk, minus its envelope, dropping into the abdomen would cause peritonitis and death.

Fig. No. 1.—This specimen was taken from a fowl sent in for post-mortem; it consists of a mass of cystic tumours very similar to a bunch of grapes. In this instance the development of the ova is abnormal, and instead of the mature yolk the calyx (the membrane which contains the yolk) contains a thin liquid; thus the ovary consists of a mass of cystic tumours suspended on long pedicles. This condition is usually confined to a strain of birds, and appears to be hereditary.

Fig. No. 2 shows a mass of egg matter taken from the lower part of the oviduct, below which the organ was twisted (a twisted oviduct may be caused by the perch being too high or too rough handling of the birds or in flighty nervous birds flying against the wire, etc.). This caused irritation of the oviduct and of its upper opening, with the result that the two eggs seen in the illustration dropped, not into the oviduct, but into the abdomen. This mass of egg matter in the oviduct is not uncommon and is often

due to an over-fatty condition of the bird, the fat pressing upon the oviduct and preventing the expulsion of an egg, and thus blocking the passage.

Illustration No. 2 shows the right type of fowl to produce (given proper treatment) a large number of eggs, also at little risk. The long back, deep broad body, with plenty of development behind the legs, give the space required for the different organs and development of eggs without risk. She is the type every poultry keeper should aim at, and such birds should always find a place in the breeding pen, provided, of course, they are in the best of health and vigour.

The appointment is announced of Mr. J. W. Shoebotham, Technical Officer, Messrs. Wm. Cooper & Nephews, Ltd., as Rhodesian representative for that company, with headquarters at Bulawayo, P.O. Box 489.

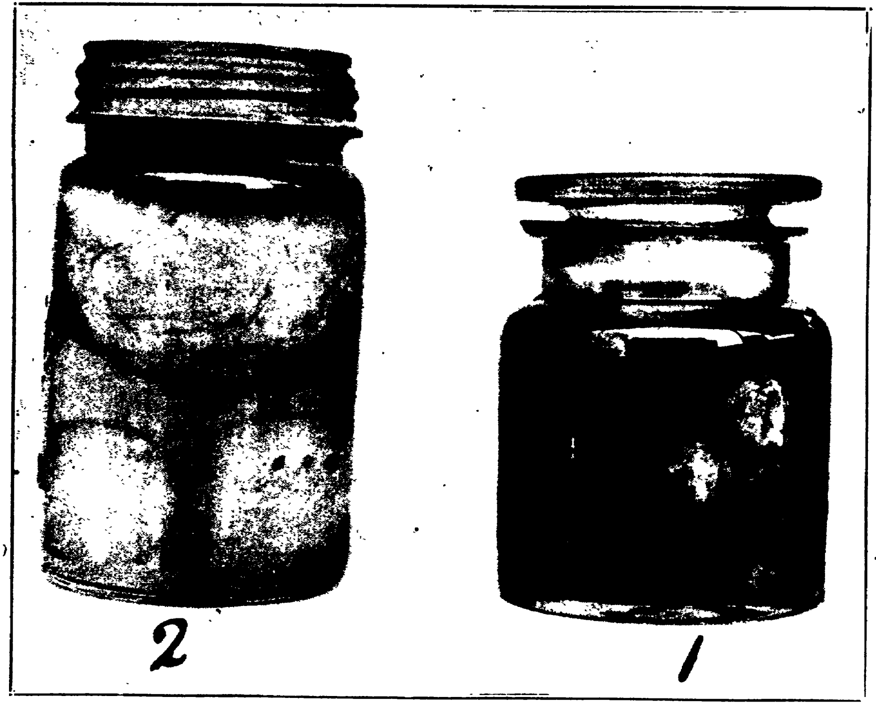


Illustration No. 1.
(See text.)

Illustration No. 2.
A good laying type.

Regulations governing the Importation of Stock into the Belgian Congo.

The following regulations, which became operative as from the 1st January, 1927, are published for general information:—

ARTICLE I.

All importations of domestic animals, cattle, horses, pigs, mules, donkeys, sheep and goats must be covered by a certificate issued by an official Veterinary Surgeon of the country of origin. The same obligation exists with regard to the transit of domestic animals.

ARTICLE II.

Sakania is appointed port of entry for all the domestic animals specified in Article I. of the present Ordinance and introduced by way of the south. Albertville is appointed port of entry for the same animals imported by way of the east.

Regulations Concerning the Port of Entry of Sakania.

ARTICLE III.

Except with the sanction of the Governor of the Province, domestic animals must only reach the port of entry of Sakania by the railway.

ARTICLE IV.

Anyone wishing to import domestic animals must notify the Director of Agriculture.

The advice mentions the number, kind, sex, the zootechnical category, origin and destination of these animals, as well as the approximate date of their arrival at the port of entry. This advice is given at the latest a fortnight, and at the earliest two months, before the arrival of the animals at the port of entry.

ARTICLE V.

On the arrival of the train at the port of entry, the importer or transitor presents to the Director of Quarantine or his substitute the veterinary certificate provided by Article I.

This document certifies that the animals, upon examination, show no signs of contagious disease and come from a region free from contagious diseases.

It indicates further—

(1) the names, Christian names and residence of the breeders;

(2) the place of entrainment of the animals;

(3) the number, kind, sex, zootechnical category and breed of the imported animals;

(4) the names, Christian names and residence of the importer or transitor.

ARTICLE VI.

The Quarantine Station of Sakania comprises two sections:—

Section A (Kabumba), appointed to receive animals which, upon arrival at the port of entry, fulfil all guarantees from a sanitary point of view. A special park is reserved in this section for valuable animals, their admission into the park being subject to a written request by the importer or transitor to the Director of Quarantine.

Section B (Lukungaba) is appointed to receive animals which, from a sanitary point of view, do not fulfil all the guarantees. Section B is divided into three sectors. Sector 1, reserved for cattle which, although covered by a veterinary certificate, do not, however, present, in the estimation of the Director of Quarantine, sufficient guarantees. Sector 2, reserved for cattle for which the veterinary certificate, although it exists according to the statement of the importer or transitor, has not arrived at the same time as the cattle. Sector 3, reserved—

(1) for cattle referred to in the preceding paragraph and for which the veterinary certificate does not arrive within eight days following the import;

(2) for cattle imported in contravention of the provisions of Article I.

ARTICLE VII.

All imported animals are submitted at the importer's and transitor's risk to a sanitary inspection, and in due course to a period of quarantine, the duration of which is determined by the Director of Quarantine or his substitute. They eventually pass through a bath of disinfectant, the composition of which is determined by the Director of Quarantine.

Animals directed to Section B, sector 3, will be submitted to a quarantine, the minimum duration of which will be thirty days.

ARTICLE VIII.

The reception, customs declaration, disembarkation, re-embarkation, re-embarkation of domestic animals, their journey by road to kraals and pastures, their enclosure during sanitary inspections, dipping, herding upkeep and feeding and general care will be borne by the importers or transitors at their own risk, under the control of the officials of the Colony.

ARTICLE IX.

The Colony places at the disposal of importers and transitors pastures, kraals and dipping tanks.

Mother of Universities.

AFRICAN STUDENTS AT LONDON CENTENARY CELEBRATIONS.

Africa is very well represented amongst the forty other countries sending students to University College, London, now about to celebrate its centenary. The African contingent includes 27 students from South Africa, 4 from Nigeria, 4 from the Gold Coast and 2 from Ashanti—a total of 37.

University College was the first institution of its kind in the world to offer education without distinction of class, race, creed or sex, principles which have been followed by all the newer University institutions of Great Britain and the British Empire. It was founded in 1827 by Henry Brougham, Thomas Campbell, the poet, and Jeremy Bentham, the utilitarian philosopher. With them were Henry Crabb Robinson, George Birkbeck, the founder of mechanics' institutes; George Grote, the banker and historian of Greece; Joseph Hume; Zachary Macaulay, father of the historian; James Mill, father of John Stuart Mill, who was one of the first students to be enrolled, and Isaac Lyon Goldsmid, the first Jew to receive a title from the British Crown.

Amongst other countries largely represented at University College, London, are Russia with 19 students, Holland (21), Australia (24), France (32), Switzerland (39), Japan (41), Germany (51), United States (52) and India (111).

Movements of New Settlers.

New Arrivals.—The following new settlers arrived in the Colony during the month of January, 1927:—

R. Harle.—Arrived from the Union on 3rd January with his two children, and has been accommodated with Mr. A. R. Lilford, Lilfordia farm, Salisbury.

Scott Bros.—Arrived from England on 4th January, and proceeded for training to Mr. V. M. Ewing's farm near Lonely Mine.

Mr. and Mrs. Eppendahl.—Arrived from the Union on 10th January, and are now with Mr. R. Munroe, Lambourne, Hartley.

W. I'Anson.—Arrived from England on 12th January, and has since been viewing land in various districts.

T. Jones and R. Minton.—Arrived from England on 13th January, and proceeded to Mr. W. H. Rogers' farm near West Nicholson.

J. D. Griffin.—Arrived from New Zealand on 18th January, and proceeded to Mr. D. McAdam, Penhalonga.

R. E. Shine.—Arrived from Kenya on 19th January on tour of inspection.

R. H. Aston.—Arrived from Union on 20th January, and joined Mr. C. Harcourt, Rocklands, Darwendale.

Newton Bros.—Arrived from England on 21st January, and proceeded for a period of training to Mr. H. D. Rawson, Arcturus.

Mitchell Bros.—Arrived from England on 23rd January, and joined Mr. O. C. Rawson, Darwendale.

H. B. Hazell.—Arrived from England on 23rd January, and has been viewing land in Salisbury district.

C. Butler.—Arrived from England on 28th January with his two sons on tour of inspection. The younger son has joined Mr. H. Taylor, Bromley, for a period of training.

Settlers who have taken up Land.—Captain and Mrs. C. A. R. Shum.—Have acquired a Crown land farm east of Banket.

Mr. and Mrs. A. G. I. Baker.—Have acquired a Crown land farm west of Trelawney.

Mr. and Mrs. E. R. H. Mills-Roberts.—Have acquired a portion of farm Vrede Hoek, Mazoe district.

Tours of Technical Officers.

The Chief Chemist will attend the meeting of the Umvukwe Farmers' and Tobacco Growers' Association on 12th March.

The Forest Officer will visit the Norton-Lydiate Farmers' Association in March.

Smithfield Prices.

The following prices, obtaining at the London Central Markets on the 13th January, have been supplied to us by Messrs. Hart, Harrison & Co.:—

Beef—Fresh killed, moderate supplies, prices firmer; chilled, good supplies, fair demand and prices steady; frozen, small supplies, trade slow. Frozen pork—poor demand, prices weakened.

English long sides, 7½d. to 9d. per lb.
Irish long sides, 7½d. to 8½d. per lb.
Argentine chilled hinds, 5d. to 5¾d. per lb.
Argentine chilled fores, 3½d. to 3¾d. per lb.
Australian frozen hinds, 4d. to 4¼d. per lb.
Australian frozen crops, 3½d. to 3¾d. per lb.
New Zealand frozen pork, 9d. to 10½d. per lb.
South African frozen pork, 5½d. to 6½d. per lb.

The Bulawayo Show.

The twentieth annual show of the Bulawayo Agricultural Society will be held on Tuesday and Wednesday, 26th and 27th July, 1927. The "Show Sale" of pedigree and well bred stock will take place on 28th July.

Southern Rhodesia Weather Bureau.

JANUARY, 1927.

Pressure.—During the month the mean barometric pressure was about normal, varying from 0.021 in. above normal at Melsetter to 0.046 in. below normal at Livingstone. There were five low pressure systems which affected our local pressure; all of these remained outside the country. A northerly low of slight intensity was at Kenhardt on the 2nd, off Durban on the 3rd, and appeared off Beira on the 5th. This was followed by a southerly low of great intensity off Durban on the 6th; this low was of fair intensity off Beira on the 7th, and remained in the vicinity of Mozambique until the 14th. A southerly low was off Capetown on the 18th and appeared very intense off the south-east coast on the 19th and then passed off to the east. A small low off Durban on the 22nd may have been connected with this one. Northerly lows of slight intensity were in evidence in the west from the 22nd to the 29th. A southerly low moved from the south coast on the 24th to Beira on the 25th, and passed off, followed by a weak southerly low off the south coast on the 28th and the east coast on the 29th. There were five high pressure systems which affected local pressure. Pressure was high in the Northern Transvaal on the 1st, 2nd and 5th. A high was in evidence off the west coast from the 1st to the 7th. It then moved east, and was off Lourenco Marques on the 10th, and affected the Transvaal and east coast up to the 14th. A high lay off the south coast on the 16th, 17th and 18th, and appeared in the Transvaal on the 21st. A southerly high was off the south coast on the 25th and 26th, and appeared in the south of the Colony on the 27th. This was followed by a southerly high off the south coast on the 29th and 30th, which moved to the Free State on the 31st. During the month, highs showed a tendency to remain in the Northern Transvaal.

Temperature.—During the month the mean temperature was generally above normal, varying from 3.4° F. above normal at Empandeni to 2.3° F. below normal at Umtali. The mean maximum temperatures were considerably above normal, varying from 9.4° F. above normal at Tuli to 3.9° F. below normal at Umtali. The mean minimum temperatures were below normal, varying from 4.5° F. below normal at Shamva to 0.9° F. above normal at Empandeni.

The relative humidity was generally slightly below normal, varying from 19 per cent. below normal at Fort Victoria to 15 per cent. above normal at Salisbury.

Rainfall.—The mean rainfall over the country amounted to 3.98 ins., as compared with a normal of 7.20 ins. January rainfall has been lower than this on six occasions, the lowest being 0.68 in. in 1921-22. The mean rainfall recorded in the various zones during the month was as under, compared with the normal rainfall:—

	Rainfall. January, 1927. Inches.	Normal, January. Inches.
Zone A (western Matabeleland)	4.79	6.24
Zone B (south-eastern Matabeleland)	2.41	5.85
Zone C (western Mashonaland)	4.34	7.68
Zone D (north-eastern Mashonaland)	5.10	8.37
Zone E (south-eastern Mashonaland)	3.55	8.08
Zone F (eastern border)	5.89	12.97

From the above it appears that the January rainfall was considerably below normal throughout the country. The total for the year to date is 12.58 ins., against a normal of 17.37 ins.

In Zone A the district with the greatest mean rainfall was Wankie, with 7.16 ins.; and the district with the least was Bubi, with 2.53 ins.

In Zone B the district with the greatest mean rainfall was Belingwe, with 5.70 ins.; and the district with the least was Chibi, with nil.

In Zone C the district with the greatest mean rainfall was Hartley, with 5.64 ins.; and the district with the least was Gwelo, with 3.64 ins.

In Zone D the district with the greatest mean rainfall was Mrewa, with 7.05 ins.; and the district with the least was Makoni, with 3.54 ins.

In Zone E the district with the greatest mean rainfall was Melsetter, with 6.70 ins.; and the district with the least was Chibi, with 2.17 ins.

In Zone F Melsetter had 6.02 ins. and Umtali 5.08 ins.

Rain Periods.—General rains occurred in two periods during the month. The first period was general on the 4th, 6th and 7th, and limited to north-eastern Mashonaland on the 5th. The second and heavier period occurred on the 28th, 29th, 30th and 31st, and continued into February. Showers were fairly frequent during the remainder of the month, but were confined chiefly to the north and east.

RAINFALL.

STATION.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE A.:				
Bubi—				
Bembesi Railway ...	3.83	2.46	8.83	15.22
Imbesu Kraal ...	...	...	...	15.89
Inyati ...	4.65	2.39	8.71	16.29
Judsonia ...	3.99	.95	7.01	n.s.
Martha Farm ...	3.31	3.58	9.82	n.s.
Shangani Estate ...	4.37	3.27	10.40	15.01
Bulalima-Mangwe—				
Centenary ...	3.93	1.97	8.23	n.s.
Kalaka ...	3.65	4.79	11.32	14.89
Riverbank ...	6.77	2.36	10.70	15.25
Solusi Mission ...	2.82	5.74	10.43	15.89
Bulawayo—				
Fairview Farm ...	4.63	2.13	9.12	14.56
Keendale ...	2.15	5.91	10.34	14.33
Lower Rangemore ...	3.98	2.47	9.02	15.49
Observatory ...	4.86	4.43	10.94	15.87
Gwelo—				
Dawn ...	5.61	...	...	16.35
Delano Estate ...	...	...	...	n.s.
Gwelo Gaol ...	8.34	3.44	14.47	17.34
Riversdale Estate ...	5.19	2.25	10.20	n.s.
Somerset Estate ...	6.57	2.77	10.72	16.58
Insiza—				
Orangedale ...	2.98	4.76	10.13	18.40
Shangani ...	4.70	2.19	8.24	15.33
Thornville ...	3.39	...	...	16.36
Nyamandhlovu—				
Edwaleni ...	4.80	...	...	15.31
Gwaai Reserve ...	6.18	3.24	10.17	n.s.
Impondeni ...	7.28	4.32	13.02	n.s.
Naseby ...	3.20	4.11	10.32	14.55
Nyamandhlovu Railway ...	4.70	3.44	9.60	14.90
Sebungwe—				
Gokwe ...	8.44	4.59	16.28	18.67
Umzingwane—				
Springs ...	4.77	3.03	9.90	16.00
Wankie—				
Matetsi Railway ...	7.80	6.53	17.90	19.55
Ngamo Railway ...	6.08	3.39	11.30	18.93
Sukumi ...	5.45	8.38	16.68	n.s.
Victoria Falls ...	5.61	8.29	16.95	18.32
Wankie Hospital ...	3.31	9.22	16.16	15.06
Waterford ...	...	...	...	...
ZONE B.:				
Belingwe—				
Bickwell ...	4.25	5.70	10.96	16.11
Bulalima-Mangwe—				
Bruwapeg ...	1.47	1.91	7.05	n.s.
Edwinton ...	3.92	4.81	11.01	15.03

RAINFALL—(*Continued*).

STATION.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	3.45	3.81	9.84	14.58
Garth ...	5.96	4.98	15.13	17.19
Maholi ...	4.87	7.60	15.48	15 75
Retreat ...	4.46	5.19	10.59	14.90
Sandown ...	4.43	3.07	8.84	n.s.
Semokwe Reserve ...	2.83	.99	7.78	n.s.
Tjankwa ...	7.88	3.69	14.82	16.49
Tjompanie ...	9.44	...	...	15.73
Chibi—				
Nuanetsi Homestead ...	.35	nil	1.38	10.79
Gwanda—				
Antelope Mine ...	1.87	1.24	7.28	13.65
Gwanda Gaol ...	1.83	3.87	7.67	14.28
Limpopo ...	.22	.49	4.23	n.s.
Mazunga ...	1.03	1 24	5.24	11.25
Tuli ...	1.93	1.38	6.63	9.69
Insiza—				
Albany ...	3.92	2.59	8.57	15.25
Filabusi ...	3.10	3.94	8.17	14 58
Fort Rixon ...	5.70	2 49	9.36	15 22
Inyezi	3.74	4.09	8 53	14.90
Lancaster ...	2.11	3.92	7.93	n.s.
Wanezi Mission ...	2.03	3.82	6.64	n.s.
Matobo—				
Bon Accord ...	2 08	3.06	6 97	n.s.
Fort Usher ...	6.83	3.30	13.19	n.s.
Holly's Hope ...	1.94	2.40	8.85	14.73
Longsdale ...	5.28	3.87	11.08	n.s.
Matopo Mission ...	8.61	2.71	12 23	17.98
Matopo School ...	5.95	1.20	...	n.s.
Mtshabezi Mission ...	1.38	3.62	6.70	15.11
Rhodes Matopo Park ...	6.31	5.94	14.03	16.24
Wenlock Ranch ...	1.38	1.26	5.85	n s.
Umzingwane—				
Balla Balla ...	3.17	6.48	19.:6	16 36
Essexvale ..	3.72	3.72	10.87	15.94
Heany Junction ...	4.15	2.85	13.07	17.73
Hope Fountain ...	...	...	...	17.36
ZONE C.:				
Charter—				
Bushy Park ...	6.55	4.36	12.89	18.88
Enkeldoorn ...	5.38	2.44	9.58	19 39
Marshbrook ...	8.87	3.66	15.79	18.67
The Range ...	7.49	4.80	15.49	20.05
Vrede ...	...	3.24	...	18.72
Chilimanzi—				
Beacon Hill ...	7.08	4.31	13.17	n.s.
Central Estates ...	8.39	3.21	13.57	19.66

RAINFALL—(*Continued*).

Station.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Chilimanzi (continued)—				
Fourie's Post ...	6.78	6.32	13.31	n.s.
Orton's Drift ...	6.78	3.68	12.04	19.66
Sebakwe Post ...	7.47	5.05	14.95	n.s.
Umvuma Railway ...	5.93	2.11	9.63	18.14
Gwelo—				
Cross Roads ...	4.67	3.61	9.81	17.32
East Clare Ranch ...	8.09	1.16	10.27	n.s.
Globe and Phœnix Mine ...	6.13	2.53	10.16	17.95
Indiva ...	4.48	3.28	9.25	n.s.
Iron Mine Hill ...	6.88	3.92	14.91	n.s.
Lyndene ...	4.83	3.91	10.98	n.s.
Lannes Farm ...	5.12	2.45	9.64	n.s.
Rhodesdale Ranch ...	4.64	4.92	12.97	17.69
Woodendhove ...	6.83	6.94	18.06	18.78
Hartley—				
Ardgowan ...	9.56	7.75	19.04	20.28
Balwearie ...	10.00	4.88	15.82	n.s.
Battlefields ...	11.16	3.56	15.80	18.43
Beatrice ...	7.81	3.75	15.10	20.91
Carnock ...	9.42	5.01	17.93	20.26
Cromdale ...	10.88	4.00	17.19	n.s.
Deweras Store ...	10.22	3.34	15.37	n.s.
Eiffel Blue Mine ...	8.00	4.80	13.96	n.s.
Elvington ...	8.07	5.28	14.97	19.98
Gatooma ...	10.54	10.64	23.01	20.44
Gatooma Experiment Station	10.85	6.97	18.96	n.s.
Gowerlands ...	8.21	3.04	15.44	19.19
Handley Cross ...	10.92	2.85	12.61	n.s.
Hartley Gaol ...	8.62	6.52	16.28	19.90
Hopewell ...	10.16	4.39	16.30	20.54
Jenkinstown ...	9.18	4.40	16.60	20.02
Maida Vale ...	13.79	5.42	19.49	n.s.
Nyadgori ...	7 59	4.07	13 65	n.s.
Palham ...	7.70	2.38	13.16	21.27
Ranwick ...	8.81	11.49	21.05	19.84
Rocky Spruit ...	9 90	5.60	18.60	n.s.
Thornby ...	...	...	...	18.93
Thorndyke ...	4.33	4.02	9.99	n.s.
Lomagundi—				
Argyle ...	8.59	3.58	13.51	18.76
Baguta ...	11.19	...	...	19.25
Between Rivers ...	10.72	4.25	15 11	n.s.
Tsanunu ...	7.78	2 23	...	n.s.
Citrus Estate ...	11.24	2.58	15.16	18.20
Darwendale ...	7.75	3.60	13.52	18.90
Debera ...	9 89	...	...	n.s.
Devonia ...	8.62	6.25	16.87	18.48
Dingley Dell ...	7.31	2.71	10.14	n.s.
Elinda ...	...	...	...	n.s.
Gambuli ...	7.41	4.84	14 14	20 51

RAINFALL—(*Continued*).

Station.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Lomagundi (continued)—				
Msina ...	9.98	3.28	...	n.s.
Impingi ...	10 55	6.28	18.46	n.s.
Kapiri ...	9.92	4.20	17.70	n.s.
Lone Cow Estate ...	10.35	1.88	14.80	19.37
Mafoota ...	9.97	3.81	14.16	n.s.
Maningwa ...	9.47	3.73	14.07	18.84
Mica Field ...	10.05	3.13	14.05	n.s.
Montrose ...	11.90	1.48	14.67	n.s.
Mpandegutu ...	9.86	4.82	16.05	n.s.
Mukwe River Ranch ...	8.67	5.12	15.31	17 68
North Banket ...	10.15	4.62	16.78	n.s.
Nyapi ...	11.12	4.59	17.48	n.s.
Nyarora ...	9.40	3.13	16.32	n.s.
Nyati ...	10.83	3.92	15.74	n.s.
Palm Tree Farm ...	9.82	2.57	13.85	18.80
Puri ...	14.05	2.59	18.43	n.s.
Raffingora ...	11.51	4.03	18.24	n.s.
Richmond ...	8.68	7.07	17.87	n.s.
Robbsdale ...	7.14	2.81	11.84	n.s.
Romsey ...	8.40	2.33	12 94	n.s.
Silater Estate .	9.87	5.56	16.18	n.s.
Sinoia ...	12.54	3.06	17.42	18.96
Sinoia's Drift ...	8.24	4.09	13.45	n.s.
Sipolilo ...	15.16	6.32	24.18	18.87
Umboe .	10 33	·3.92	14.52	n.s.
Umvukwe Ranch ...	9.76	4 66	16 03	19.31
Woodleigh ...	10.13	4.38	16.80	n.s.
Yeanling ...	13.51	2.11	15.62	n.s.
Salisbury—				
Avondale (Broadlands) ...	9.26	3.48	14.39	19.68
Ballineety ...	6.56	2.90	12.74	n.s.
Botanical Experiment Station	8.93	1.74	11.83	19.30
Bromley ...	9.98	4.80	16.90	19.25
Cleveland Dam ...	10.41	4.82	19.18	19.23
Gwebi ...	7.70	3.51	14.18	19.85
Hillside ...	...	...	...	17.34
Lochinvar ...	6.09	4.64	12.81	18.13
Manor Farm ...	9.55	5.13	16.75	n.s.
Pendennis ...	9.70	3.77	14.42	n.s.
Salisbury Agricultural Dept.	8.29	3.84	13.55	n.s.
Sebastopol ...	9.74	2.86	14.82	20.32
Selby ...	...	...	...	n.s.
Stapleford ...	7.93	5.78	17.08	20.94
Tobacco Experiment Station	7.67	3.67	16.44	n.s.
Vainona ...	9.27	3.85	14 29	20.47
Western Commonage ...	7.26	3.80	14.32	20.50
Sebungwe—				
Sikombela ...	9.04	4.40	15.52	19.94
Wolverley ...	1.51	...	...	n.s.

RAINFALL—(*Continued*).

STATION.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	7.21	5.92	15.05	n.s.
Fountains ...	2.13	3.91	7.19	n.s.
Mount Darwin ...	8.81	5.50	15.79	18.92
Rusambo ...	6.81	4.67	13.62	n.s.
Inyanga—				
Inyanga ...	10.29	2.69	15.67	23.24
Juliasdale ...	8.92	5.15	...	n.s.
Rhodes Estate ...	6.53	...	...	24.18
Makoni—				
Ardlamont ...	7.25	...	...	n.s.
Eagle's Nest ...	8.12	5.19	18.25	20.77
Mayo Ranch ...	5.49	...	...	n.s.
Nyogeni ...	7.14	1.89	9.03	n.s.
Kelvin ...	...	...	...	n.s.
Wensleydale ...	...	...	...	n.s.
Marandellas—				
Fault Farm ...	8.21	5.71	18.36	n.s.
Mazoe—				
Argyle Park ...	8.99	3.09	14.68	n.s.
Atherstone ...	5.87	5.91	13.48	n.s.
Bellevue ...	9.21	5.00	15.47	n.s.
Benridge ...	9.91	3.69	14.53	n.s.
Bindura ...	7.16	3.96	12.28	20.77
Ceres ...	5.80	7.97	16.06	22.29
Chipoli ...	9.67	5.15	15.90	19.83
Citrus Estate ...	8.75	3.96	15.60	20.13
Craigengower ...	9.30	3.51	14.06	19.42
Dandejena ...	7.69	4.51	13.54	n.s.
Donje ...	13.28	3.70	18.85	n.s.
Dundry ...	...	...	...	n.s.
Frogmore ...	9.77	4.77	15.65	n.s.
Glen Divis ...	11.53	4.06	17.56	n.s.
Glen Grey ...	10.76	4.32	16.39	n.s.
Hinton ...	8.76	3.50	13.58	n.s.
Great B ...	9.80	3.41	14.41	n.s.
Kilmer' ...	9.53	3.17	13.83	19.93
Kingston ...	6.74	6.15	15.31	22.26
Mazoe ...	6.45	5.33	13.39	20.28
Maienzi ...	6.45	5.29	13.35	n.s.
Marston ...	7.14	...	...	n.s.
Mgutu ...	11.76	4.50	18.03	n.s.
Muripfumba ...	8.41	2.62	12.76	n.s.
Omeath ...	12.76	5.80	20.29	19.58
Pearson Settlement ...	8.73	3.28	14.89	n.s.
Pembi Ranch ...	8.93	...	...	n.s.
Riversdale Estate ...	11.37	5.43	18.00	n.s.
Ruia ...	9.54	4.46	15.85	21.90
Horta ...	12.83	2.55	...	20.08
Rustington ...	8.39	5.78	15.00	n.s.
Shamva Mine ...	6.94	6 97	16.40	20.70

RAINFALL—(*Continued*).

Station.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Stanley Kop ...	8.55	3.78	14.75	19.23
Sunnyside ...	12.65	5.13	19.65	20.39
Teign ...	8.85	2.54	12.82	n.s.
Usk ...	11.23	5.97	19.22	20.21
Vergenoeg ...	...	...	...	n.s.
Virginia ...	10.02	4.54	16.49	19.07
Visa ...	10.82	6.41	18.24	n.s.
Woodlands ...	6.76	6.43	14.61	20.40
Zombi ...	9.02	6.97	17.98	21.89
Mrewa—				
Maryland ...	10.22	5.25	16.25	n.s.
Mrewa ...	9.10	8.74	19.62	21.66
Selous Nek ...	4.81	7.17	13.82	20.71
Mtoko—				
Makaha .	10.08	3.18	14.21	19.55
Mtoko	8.83	6.09	18.39	17.20
Nyaderi Mission ..	9.54	5.27	17.92	n.s.
Salisbury—				
Arcturus ...	8 87	8.12	18.89	22.77
Calgary ...	8.68	4.31	14.39	n.s.
Chindamora Reserve ...	8.37	4.08	14 29	n.s.
Chinyika ...	9.63	4.76	17.36	n.s.
Glenara ...	9.86	3.80	15.11	19.43
Goromonzi ...	10.76	7.49	20.06	23.59
Hatcliffe ...	7.35	4.55	12.83	20.68
Hillside (Bromley) ...	12.37	4 10	19.86	n.s.
Kilmuir ...	9.96	7.86	20.08	n.s.
Meadows ...	10.36	6.63	18.10	23.50
Selby ...	8.00	3 71	14.23	18.86
Springs ...	6.48	6 78	14.40	n.s.
Teviotdale ...	...	5.26	...	n.s.
Zone E.:				
Belingwe—				
Belingwe (N.C.) .	2.56	2.67	6.17	15.19
Doro ..	2.51	3.61	7.29	n.s.
Shabani ...	1.97	3.79	5.72	n.s
Bikita—				
Angus Ranch ...	2.26	3.74	7.67	15.55
Bikita ...	3.82	4.46	10.33	n.s.
Devuli Ranch ..	2.89	3.44	...	n.s.
Charter—				
Buhera ...	8 54	4.47	17.81	22.56
Chibi—				
Chibi ..	1.88	3.69	9.03	15.17
Lundi ...	1 32	.66	5.94	13.83
Chilimanzi—				
Alanberry ...	7.29	2.15	11.60	17.25
Driefontein .	6 02	3 06	10.47	17.71
Felixburg ...	5.88	3.17	10.58	19.47

RAINFALL—(*Continued*).

STATION.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Chilimanzi (continued)—				
Grootfontein ...	5.09	5.62	11.65	18.77
Induna Farm ...	6.47	1.52	9.72	20.46
Mtao Forest ...	4.79	1.90	8.67	n.s.
Requeza Estate ...	6.32	2.02	10.25	n.s.
Thornhill ...	4.24	2.26	8.90	n.s.
Gutu—				
Alheit Mission ...	4.71	1.88	...	15.07
Chindito ...	6.18	2.72	11.90	20.95
Eastdale Estate ...	6.22	1.95	11.88	20.56
Gutu ...	8.96	2.71	16.98	19.52
Glenary ...	8.82	2.79	14.12	16.75
Gwelo—				
Glencraig ...	6.08	3.67	11.07	n.s.
Partridge Farm ...	4.24	5.04	12.47	22.95
Sheep Run Farm ...	5.14	4.43	12.89	19.22
Inyanga—				
St. Trias' Hill ...	6.78	4.02	17.70	24.78
Insiza—				
Roodeheuvel ...	6.82	2.32	10.15	17.09
Makoni—				
Craigendoran ...	10.28	3.44	17.34	18.94
Forest Hill .	6.11	3.71	13.98	21.00
Gorubi Springs ...	3.69	3.83	14.87	20.31
Inyagura ...	5.31	3.61	13.47	n.s.
Makoni Kop ...	8.23	3.62	15.62	n.s.
Mande ...	3.93	6.08	15.81	n.s.
Mona ...	5.42	3.91	12.71	22.58
Monte Cassino ...	13.38	4.62	21.31	22.31
Romsley ...	...	...	...	n.s.
Ruati ...	5.10	6.64	16.11	n.s.
Rusape ...	3.67	5.19	14.27	19.51
Tablelands ...	7.42	7.88	19.40	n.s.
Tsungwesi Ranch ...	7.63	7.51	18.92	n.s.
Springs ...	9.62	3.47	20.42	20.11
Whitgift ...	6.70	3.64	13.08	n.s.
Marandellas—				
Benongwe ...	6.65	4.24	14.60	20.79
Delta ...	5.62	4.06	11.71	20.59
Elandslaagte ...	5.25	2.09	12.76	n.s.
Marandellas Estate ...	7.39	1.85	13.16	20.73
Lendy Estates ...	10.56	6.15	18.30	22.20
Lushington ..	5.22	4.19	12.65	n.s.
Macheke ...	8.64	4.70	16.09	22.66
Marandellas ...	8.41	4.75	17.50	23.59
Nelson ...	7.83	2.44	15.70	18.22
Tweedjan ...	7.78	2.03	16.24	22.13
Wenimbi ...	...	...	...	n.s.

RAINFALL—(*Continued*).

Station.	1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(continued)				
Melsetter—				
Brackenbury ...	2.76	6.70	16.73	34.03
New Year's Gift ...	4.53	...	...	n.s.
Tom's Hope ...	...	...	...	31.01
Ndanga—				
Doornfontein ...	5.25	3.70	10.23	16.89
Manjirenji ...	3.72	...	...	n.s.
Marah Ranch ...	6.18	4.35	12.16	20.12
Zaka ...	5.54	2.22	10.32	24.83
Selukwe—				
Aberfoyle Ranch ...	5.86	2.26	9.15	20.13
Danga ...	...	...	...	n.s.
Hillingdon ...	8.05	3.22	13.32	20.27
Impali Source ...	7.07	1.40	9.90	n.s.
Rio ...	6.65	3.48	15 63	18.99
Safago ...	8.32	3.25	15.60	20.92
Selukwe Gaol ...	5.76	2.27	...	n.s.
Tokwe Block ...	5.91	3.33	13.01	n.s.
Woodlands ...	6.15	5.10	12.35	n.s.
Umtali—				
Alicevale ...	7.09	4.60	14.11	20.17
Argyll ...	4.41	4.96	12.67	20.08
Embeza ...	11.01	6.01	26.61	n.s.
Fairview ...	5.80	3.09	13.82	n.s.
Fern Valley ...	5.83	3.37	12.55	n.s.
Jerain ...	5.51	1.26	9.48	20.56
Mutambara Mission ...	8.10	2.08	13.47	18.95
Odzani Power Station ...	10.29	3.65	16.89	23.34
Park Farm ...	9.34	4.67	18.26	n.s.
Premier Estate ...	6.34	2.75	11.51	19.68
Sarum ...	5.04	4.97	12.16	18.21
Stapleford ...	...	...	...	45.68
St. Augustine's Mission ...	8.02	3.93	16.85	n.s.
Transsau Estate ...	4.38	6.69	14.97	n.s.
Umtali Gaol ...	5.62	3.45	12.04	21.01
Victoria—				
Brucehame ...	6.80	3.10	11.06	17.83
Cambria ...	4.43	2.38	8.71	n.s.
Cheveden ...	4.70	4.46	12.37	n.s.
Clipsham ...	3.62	1.67	6.76	18.20
Gokomere ...	2.73	1.94	7.17	18.40
Makowries ...	6.47	1.83	10.30	n.s.
Mashaba ...	4.11	2.71	8.43	n.s.
Miltonia ...	3.14	3.20	9.01	n.s.
M'Sali ...	3.32	1.79	7.24	n.s.
Riverdene North ...	4.17	2.08	7.73	18.79
Salemore ...	6.08	3.29	10.51	n.s.
Silver Oaks ...	5.28	4.12	11.69	18.23
Stanmore ...	4.71	1.26	6.79	n.s.
Victoria ...	4.86	3.44	9.69	16.87
Zimbabwe ...	4.70	3.43	12.73	n.s.

RAINFALL—(*Continued*).

STATION.		1926. Dec.	1927. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE F.:					
Melsetter—					
Chikore	...	7.44	3.98	16.94	23.76
Chipinga	...	6.74	3.21	...	24.59
Lettie Swan	...	8.40	5.96	20.75	n.s.
Melsetter	...	8.94	8.09	22.87	26.04
Mount Selinda	...	9.68	6.93	22.45	34.56
Springvale	...	...	...	...	n.s.
Tom's Hope, East	...	1.84	4.01	...	n.s.
Vermont	...	9.61	9.95	29.45	35.62
Umtali—					
Chimeze	...	13.86	5.08	24.77	n.s.
Hoboken	...	...	...	...	n.s.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	March	April
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	12	9
Banket Junction	Banket Hotel	F. Potts	4	1
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	31	28
Bindura	Bindura Farmers' Hall	W. E. Fricker	12	9
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	2	6
Bubi	Queen's Mine	E. C. Gaudin	8	12
Chakari	Various farms	L. T. Tracey	17	21
Chatsworth	Makowries Farm	A. W. White	5	2
Daisyfield	Somabula (March), Daisyfield (April)	L. E. Edwards	12	16
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	12	9
Enterprise	Farmers' Hall	John Johnstone	7	4
Essexvale	Essexvale	C. Geneve	20	17
Felixburg—Gutu	Various Farms	C. L. Burrows	...	9
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	1	5
Gadzema	Gadzema	G. M. Leahy	13	10
Gatooma	Speck's Hotel	C. M. Davenport	19	16
Gazaland	Court House, Chipinga	D. M. Stanley	7	4
Greystone	Quarrie Farm	P. J. van der Walt	12	...
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	10	14
Inyazura	Inyazura	Major Tulloch	...	1
Lalapansi	Lalapansi	Edmund Chapman	12	9
Lomagundi	Sinoia	F. W. Robertson	...	8
Lomagundi West	Various farms	E. Morton	20	17
Macheke	Macheke	M. J. Palmer	12	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	6	3
Makwiro	Makwiro	F. H. Howard	18	15
Makoni	Rusape	—. Munch	12	9

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	4	1
Marandellas, Southern	Various farms	D. J. Gale	2	6
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	11	8
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A. Carnegie	10	14
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	19	16
Mazoe (Concession)	Concession Hotel	Frank Allen	8	12
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	9	13
Melsetter	Court House, Melsetter	Dr. Rose	10	14
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	9	13
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	26	30
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	4	1
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	5	2
Poorte Valley	Various places	D. Wilson	19	16
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	19	16
Salisbury South	Various farms	P. Linton	30	27
Selukwe	The Hotel, Selukwe	W. T. Simpson	4	1
Shamva	Shamva Hotel	E. Butler	17	21
Two Rivers Farming Association	Various farms	W. L. Parsons	12	9
Umboe (Branch of Lomagundi F.A.)	Various farms—Mar. mtg., Palm Tree	A. J. Hawkes	12	...
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	12	16
Umtali	Drill Hall, Umtali	A. Howat	3	7
Umvuma and District	Umvuma	H. B. Colling	Not	received
Victoria	Victoria	H. Payne	11	8
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	9	13
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...		1,965
February ...										
March ...										
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

March.

BEE-KEEPING.

Be on the look-out for damage to stocks by the wax moth; strong stocks generally tend to obviate this pest. Where the heavy rains have penetrated the weak hive roofs and caused dampness among the quilts, these should be taken off and thoroughly dried in the sun, then replace. Contract the entrances of hives to prevent robbing. Unsold honey should be stored in a warm dry cupboard. Keep apiary clear of weeds.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

CROPS.

This is the commencement of the ripening period for most summer crops, which, if they have been kept free of weeds, will require but little further attention. Harvesting of early maturing crops, such as buckwheat, summer oats, linseed, beans and hay crops, may begin. Rape, kale and drumhead cabbage and winter cereals may be sown in moisture-retaining soils or under irrigation for autumn feeding. Onion seed may be sown in beds for the winter crop. Hay-making should be undertaken at every possible opportunity; delay involves deterioration in the quality of the hay obtained. The ensilage pits should have been cleared out, and Napier fodder, maize and other crops can be ensiled as they become ready. Crops intended for green manuring as they become ready should be turned under. Stooking of early maize will probably be commenced and ploughs should be overhauled and lands from which the crops have been harvested should be ploughed as soon as possible. The preparation of lands for the main winter crops should commence.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) 1½ ozs., treacle ½ gallon (or cheapest sugar 2½ lbs.), water 4 gallons, to keep down fruit flies. For leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

FLOWER GARDEN.

Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.

VEGETABLE GARDEN.

The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains entirely cease, it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.

FORESTRY.

If necessary, cultivate between the rows of trees planted out in the previous months. Plough any fire lines that are necessary and break up any new ground that will be required for next season's planting. Remember that the roots of trees penetrate deeply into the ground, and therefore plough as deeply as possible. Where black wattle thrives, sow seed this month, after well soaking.

GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird; many are apt to get thin and run down in health, due to their allowing their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in. See that it is working well and keeping an even temperature before trusting it with the eggs. Many attempt to run an incubator in any old place. I saw one recently in a kitchen not far from the stove! Of course this was a hopeless proposition. It should be in a well ventilated, but not draughty room in which there is nothing else; no full sacks, empty sacks, saddles, boxes, etc., as one so often sees.

A pamphlet on "Incubation and Rearing" can be obtained gratis from either the Editor or the Poultry Experts. Farmers and poultry keepers do not seem to realise that pamphlets on every phase of poultry keeping can be so obtained, and many spend money on poultry books that are not up to date and do not deal with Rhodesian conditions.

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

Southern Rhodesia Veterinary Report.

November, 1926.

AFRICAN COAST FEVER.

Umzingwane District.—At the Essexvale east section there was a marked improvement, a mortality of eight head only being recorded. At Essexvale south there was a marked decrease in the mortality subsequent to the removal of over 2,000 head to clean or slightly infected veld, the number of deaths being 239 head, compared with 1,085 during the previous month.

Matobo District.—At the infected farm Malaje four animals were destroyed on showing a rise of temperature. A fresh outbreak occurred on the farm Alalie, when a beast died on 31st October, Coast Fever being diagnosed microscopically. All cattle on the farm were temperatured regularly during the month, but no further cases were discovered.

Umtali, Melsetter, Mazoe and Gwelo Districts.—No cases at any of the infected centres.

SWEATING SICKNESS OF CALVES.

Prevalent in the Macheke inspectorate.

CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

Prevalent in various districts in Mashonaland.

TRYPANOSOMIASIS.

A considerable mortality in cattle occurred in the Hartley district.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 43; cows and heifers, 33; horses, 7; donkeys, 4; sheep, 1,377; goats, 314.

EXPORTATIONS (CATTLE).

To Germany, via Capetown:—130. To Union of South Africa:—Slaughter cattle for consumption in the Union, 431; slaughter cattle for overseas export: via Durban, 1,308; via Johannesburg, 229. To Belgian Congo:—Slaughter cattle, 279; breeding cattle, 24. To Portuguese East Africa: 68 head.

EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa:—Goats, 30; sheep, 75; pigs, 113. To Northern Rhodesia:—Horse, 1; sheep, 220. To Belgian Congo:—Goats, 70; sheep, 130; pigs, 127. To Portuguese East Africa:—Goats, 25; sheep, 25.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Notes from the "Gazette."

"Gazette" Date.	Items.
	CATTLE DIP CONTROL ACT, 1926.
11.2.27.	Government Notice No. 85 brings the Act into force and provides for the rendering of returns for checking the consumption of dip in the Colony.
	AFRICAN COAST FEVER.
	Matobo and Umzingwane Native Districts.
11.2.27.	Government Notice No. 86 enlarges the area of infection by the inclusion of Bushy Park and Heany Junction. It also amends the guard area.
	ROAD REGULATIONS.
11.2.27.	Government Notice No. 80 declares the following to be a branch road:—From a point on Martin Farm, thence running in a north-westerly direction across the Railway Strip and the farms Salop, Croc-na-ragh, Crown Land, Georgia, Perth, Milan, Crown Land, Clyde, Savoy, Crown Land, Chadshunt Mine Farm, Grantley and Chevy Chase to a point on Deweras Ranch.
28.1.27.	Government Notice No. 42 declares the following to be a branch road:—From a point on the farm Squatodzi, thence running in a south-easterly direction across the farms Mfuti, Msasa and Mzanzhi, across the south boundary of Mzanzhi, thence in an easterly direction across the farm Virginia, to meet the existing Salisbury-Sinoia Road on that farm.
	DAIRY PRODUCE ACT, 1925.
28.1.27.	The first day of March, 1927, is fixed as the date on and after which no premises shall be used as cream depots, cream factories or cheese factories unless such premises have been registered in the prescribed manner.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 416. Grasses of Agricultural Importance in Southern Rhodesia, by H. G. Mundy, F.L.S., G. N. Blackshaw, O.B.E., B.Sc., F.I.C., and E. V. Flack.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 423. The Common Sunflower, by C. Mainwaring.
No. 428. The Sweet Potato, by J. A. T. Walters, B.A.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 462. Hay-making in Rhodesia, by C. Mainwaring.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agr., F.L.S., Chief Agriculturist.
No. 504. Castor Oil, by Guy A. Taylor, M.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.

REPORTS ON CROP EXPERIMENTS.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.

No. 564. A Maize Rotation Experiment, by A. R. Morkel.

No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

TOBACCO.

No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser.

No. 623. Report on Experiments at the Tobacco Experiment Station, Salisbury, Seasons 1924-25 and 1925-26, by A. C. Newton, B.Sc.

No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

Fire-Curing Tobacco Barn, by the Tobacco Advisers.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

LIVE STOCK.

No. 489. Further Notes upon the Feeding of Farm Animals, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.
No. 589. Raising Pigs for Profit, by MacW. Ingram, Garth Farm, P.B. Bulawayo.
No. 624. The Construction of Dipping Tanks for Cattle (Revised).
Arsenite Cattle Dip—How to Mix.

DAIRYING.

No. 383. Control of Temperature in Dairying, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 418. Manufacture of Cheddar Cheese, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 427. Common Defects in Butter-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 463. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 498. Gouda or Sweet-Milk Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 511. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).
No. 567. Cottage Cheese, by J. R. Corry, B.Sc. (Agr.).
No. 572. The Pasteurisation of Milk and Cream, by J. R. Corry, B.Sc. (Agr.).
No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).
No. 583. Cream Cooling Devices, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 594. Milk Recording and its Advantages, by T. Hamilton, M.A., N.D.A., N.D.D. Introduction by J. R. Corry, B.Sc.
No. 604. Farm Butter Making, by T. Hamilton, M.A., N.D.D., N.D.A., Dairy Expert.
No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.
No. 612. Production of First-Grade Cream, by J. R. Corry, B.Sc.
Drawings of cow byres can be obtained upon application to the Dairy Expert, Department of Agriculture, Salisbury.

VETERINARY.

No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 364. Round-worm Infection of Calves, by H. E. Hornby, M.R.C.V.S.
No. 474. Heartwater.
No. 480. Measles in Swine, by P. D. Huston, M.R.C.V.S.
No. 488. A Note on an Outbreak of Infectious Abortion associated with Sterility, by Ll. E. W. Bevan, M.R.C.V.S., and P. D. Huston, M.R.C.V.S.
No. 500. Infectious Abortion, by Ll. E. W. Bevan, M.R.C.V.S.
No. 536. Inoculation of Cattle against Redwater and Gall Sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 570. The Spaying of Bovines, by G. C. Hooper Sharpe, M.C., M.R.C.V.S., and M. H. Kingcome, M.R.C.V.S.

No. 597. Suspected Poisoning of Stock: The Proper Procedure, by M. H. Kingcome, M.R.C.V.S. (Lon.), and A. W. Facer, B.A. (Oxon.), A.I.C.

No. 618. Notes from the Veterinary Laboratory: Quarter Evil, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 628. The Influence of Dipping in Solutions of Arsenic upon the Course of Trypanosomiasis, by Ll. E. W. Bevan, M.R.C.V.S.

Services of Government Veterinary Surgeons.

IRRIGATION.

No. 270. Odzani River Irrigation Scheme, by W. M. Watt.

No. 349. The Hydraulic Ram, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.

No. 376. Notes on the Water Law of Southern Rhodesia, by R. McIlwaine, M.A., LL.B.

No. 384. The Application of Water in Irrigation, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 400. Soil Washing, by A. C. Jennings, A.M.I.C.E., A.M.I.E.E.

No. 412. Water Power Resources of Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 452. Weirs and their Construction, by A. C. Jennings, A.M.I.C.E., A.M.I.E.E.

No. 475. Soil Washing, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 521. Water: Its Use for Irrigation, by E. V. Flack.

No. 529. The Umtali River Irrigation Scheme, by C. P. Robinson, B.Sc.

No. 558. How to use an Engineer's or Farm Level, by P. H. Haviland, B.Sc. (Eng.).

No. 565. Further Notes on Soil Erosion, by P. H. Haviland, B.Sc. (Eng.).

Engineering Advice.

FORESTRY.

No. 366. The Management of Woods, by J. S. Henkel.

No. 439. Forestry in Rhodesia: Planting and Care of Forest Trees, by J. S. Henkel.

No. 470. Forestry in Southern Rhodesia: The Propagation of Eucalypts, by J. S. Henkel.

No. 512. Indigenous Timbers for Fencing, by J. S. Henkel.

No. 523. Tree Planting and Termites, by A. S. Thornewill, B.A.

No. 555. Forestry in the Melsetter District, by J. S. Henkel.

No. 575. Tending of Eucalyptus Plantations, by A. S. Thornewill, B.A.

No. 578. Rules for Tree Planting, by A. S. Thornewill, B.A.

No. 611. Wind Breaks and Shelter Belts, by A. S. Thornewill, B.A.

No. 619. Price List of Forest Tree Transplants, Ornamental Shrubs, Hedge Plants and Seeds obtainable at the Government Forest Nursery, Salisbury.

No. 620. Trees and Shrubs for Sale. Obtainable at the Government Forest Nursery, Mtao Forest Reserve, Fairfield Siding, P.B. Umvuma.

No. 621. The Raising of Plants from Cuttings, by A. S. Thornewill, B.A. and Dip. in Forestry (Oxon.).

HORTICULTURE.

No. 424. Citrus Fruit Growing in Rhodesia, by A. G. Turner.

No. 471. Budding of Citrus Trees, by A. G. Turner.

No. 596. Establishment and Care of a Home Orchard, by G. W. Marshall, Horticulturist.

A Comparative Study of the Citrus Industry of South Africa, by Herbert J. Webber, Ph.D., D.Agr. Price 2s.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.

No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.

No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.

No. 197. Chafer Beetles, by R. W. Jack, F.E.S.

No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.

No. 214. Some Household Insects, by R. Lowe Thompson, B.A.

No. 219. More Household Insects, by R. Lowe Thompson, B.A.

No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.

No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.

No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.

No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S., Government Entomologist.

No. 280. The Maize Beetle, by R. W. Jack, F.E.S.

No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.

No. 291. Cutworms, by Rupert W. Jack, F.E.S.

No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.

No. 353. Further Experiments with Poisoned Bait on Maize Lands, by R. W. Jack, F.E.S.

No. 385. The Common Fruit Beetle, by R. W. Jack, F.E.S.

No. 402. Ticks Infesting Domestic Animals in Southern Rhodesia, by R. W. Jack, F.E.S.

No. 425. Notes from the Entomological Branch, by Rupert W. Jack, F.E.S., Chief Entomologist.

No. 450. Insect Pests of Fruits other than Citrus in Southern Rhodesia, by R. W. Jack, F.E.S.

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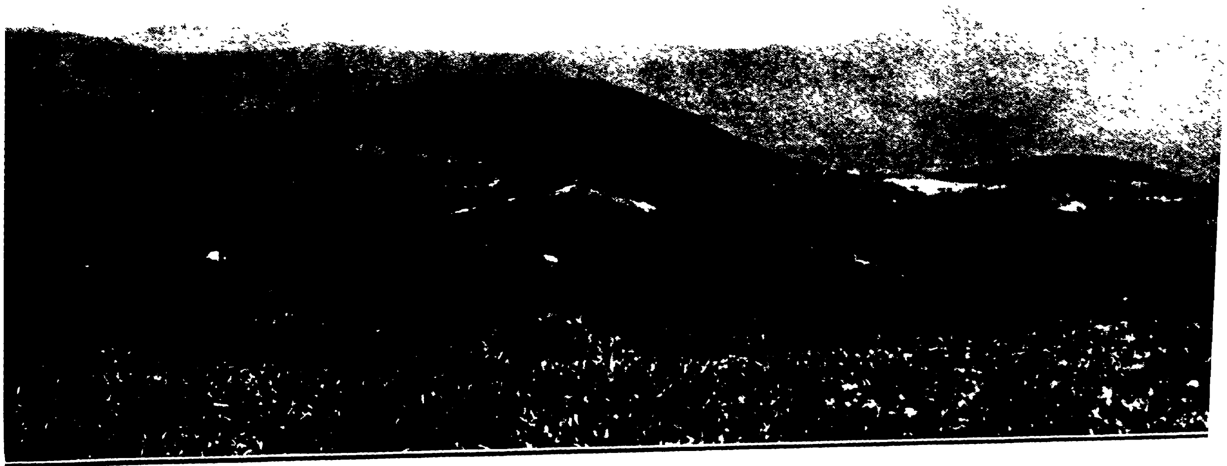

Umtali Mountains from Cloudlands (Mr. L. Cripps

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Poultry Industry.—We are very pleased to publish in this issue of the *Journal* an article by Mr. Gordon Cooper of Essexvale, who describes in a practical and lucid manner the methods employed by him in his business of farming poultry on commercial lines. The article will, we feel sure, be read with great interest by all those who are engaged in the poultry industry in this Colony, and the data which Mr. Cooper supplies will be found extremely useful in forming a basis on which to work a big plant. Mr. Cooper does not dogmatise; as he states, the methods described are those which he considers to be best suited to his own particular

conditions, and they might have to be modified in another set of circumstances. The Poultry Expert does not agree with all that is written, and we have appended to the article some notes of his setting forth the points of difference. These, however, do not appear to be of major importance, and we feel that Mr. Cooper has laid poultry men under a deep debt of obligation in placing on record methods which have brought him successful results.

South African Fruits.—Evidence of the publicity work undertaken by the Empire Marketing Board to which reference was made in the January issue of this *Journal* is to hand in the form of a poster which has been sent to us by the secretary of the Board. The subject matter of the poster has to do with South African fruits, and the illustrated part of it depicts the off-loading of a cargo of fruit at the docks. In bold type is printed the words "Summer Fruits are Here," and in the letterpress below "Down the gangways, across the quays, into the shop windows come the fresh fruits of South African sunshine." The South African fruits listed are grapes, peaches, plums, apricots, nectarines, pineapples and pears. The poster concludes with the words "To-day's pick of the Empire Basket—South African Fruits."

South African fruits are in good demand in England to-day, but there is no doubt that intelligent and systematic advertising will increase this demand very materially. This will be to the advantage of the fruit grower in South Africa, and will undoubtedly lead to an expansion of the fruit-growing industry and the consequent filling up of some of the empty spaces of the land. We in Rhodesia have not yet reached the stage when we can export deciduous fruits in bulk, but, as the Horticulturist points out in the article which appears elsewhere in this issue of the *Journal*, all the fruits in question can be grown successfully in various parts of the Colony, and there is no reason why we should not participate in this profitable trade.

It is possible that the Empire Marketing Board will direct its attention to the advertising of South African citrus fruits when the season arrives. Rhodesia will be a large exporter of such fruits to the United Kingdom this year, and

it is possible therefore that we shall have tangible proof of the good work which the Board is doing in the interests of the Empire.

Frozen and Chilled Meat.—Messrs. George C. Kean and Co., Ltd., of 17, St. Helen's Place, London, E.C. 3, have issued a "General Survey of the Markets for Frozen and Chilled Meat, 1926."

The imports of chilled beef during the year, says the report, amounted to slightly more than 5,895,000 quarters, which is an increase of over 600,000 quarters on the total for 1925, and about 740,000 quarters more than in 1924. The increase is even greater when the actual weight comparison is taken into account, owing to the large percentage of very heavy quarters received, a result of the excellent season in the Argentine.

The total importations of frozen beef from Australasia and South America amounted to just over 1,610,000 quarters, or about 563,000 quarters less than both the preceding years. The greater part of this decrease was in shipments from South America, but was compensated by more than a corresponding increase in chilled shipments from that source. Australian imports were approximately 220,000 quarters less than the previous year, while New Zealand shipments exceeded the 1925 import by about 5,000 quarters.

Arrivals of mutton in the U.K. during the year from the three main sources amounted to approximately 5,220,000 carcases, a figure which exceeds the 1925 total by about 100,000 carcases, and the 1924 total by just over 184,000 carcases.

Receipts from New Zealand during the year amounted to almost 2,300,000 carcases, which is an increase of nearly 96,000 carcases on the total of the preceding year, and an increase of over 230,000 carcases on the 1924 total.

Roughly 460,000 carcases were received from Australia during the year, as compared with about 258,000 carcases in 1925, and about 214,000 carcases in 1924, so that the increase in mutton from Australia is nearly 115 per cent. on the 1924 total, and about 78 per cent. on last year's figure.

Imports from various sources in South America totalled almost 2,463,000 carcases, which is about 200,000 carcases less than in 1925.

The total arrivals from the three great lamb exporting countries, New Zealand, Australia, and South America, amounted to just over 8,830,000 carcases, a figure slightly under the previous year's total of about 8,890,000 carcases.

The importations from New Zealand amounted to over 4,986,000 carcases; this seems a record import to the U.K. from that source, and is about 55 per cent. of the total import of lambs for the year. The increase on the 1925 total is over half a million carcases, or fully 11 per cent.

The total of the year's imports from Australia amounted to about 1,725,000 carcases, which is an increase of about 190,000 carcases over the preceding year and considerably over half a million more than in 1924.

The imports from the various sources in South America total close on 2,120,000 carcases, which is a decrease of about 760,000 carcases as compared with the previous year, although a slight increase on the total for 1924.

Tobacco.—All the reports which have reached us go to show that the tobacco crop this year will be a heavy one, eclipsing by a very considerable margin the biggest crop ever grown in this Colony. The weather, so far as the greater part of Mashonaland is concerned, has favoured the tobacco crop, the bounteous rains which fell at the end of November and continued through the whole of December being ideal for the establishment and growth of the young plants. A lengthy dry spell in January caused a good deal of anxiety in many districts, but fortunately, when matters seemed almost at their worst, heavy rains were experienced which quickly revived the plants, while a succeeding spell of dry, sunny weather brought the crop along very quickly, so that in some areas curing was in progress early in February. In some instances, owing to the check it received in the early part of the season, the leaf is on the small side, but in many areas exceptionally heavy crops are being reaped, while the quality is excellent. It can safely be said at this date that

there will be a very large out-turn of good bright tobacco from the Colony this year. Matabeleland generally has suffered severely from lack of rain, and unfortunately many of the tobacco crops in that province have failed. There are some areas, however, in which fair crops will be reaped, though the yields will probably be light.

It is evident that the capacity of the tobacco warehouse at Salisbury will be taxed to its utmost to handle the season's crops, and there may possibly be some delay in disposing of the leaf. The expansion of the tobacco-growing industry has been such that production for the time being has outstripped the organisation set up to handle the leaf, but we have no doubt that in due course the position will be righted. Those growers who are competent to grade their leaf on the farm will reap the advantage this year in that they will avoid undue delay in the grading and disposal of their tobacco.

The necessity for the grower to grade his own tobacco has been insistently emphasised by this Department, and in the *Rhodesia Agricultural Journal* of February, 1920, an article appeared which gave full details of the process. In April, 1925, the subject of handling tobacco was dealt with in an article which contained a number of illustrations showing the correct and incorrect method of baling the leaf. The supply of reprints made of these articles is unfortunately exhausted, but we hope at an early date to publish a further article on the two subjects by the Tobacco and Cotton Expert.

Most of the tobacco grown this season will in due course be exported to England, where Rhodesian leaf has created a good impression which has been reflected in the prices paid for the shipments already sent. On the matter of prices it may be of interest to publish an extract from the well-known trade journal *Tobacco*. The extract is from an editorial article published in the issue of 2nd February, and bears the caption "Rhodesian Leaf Prices." The article reads:—

"An experienced firm of leaf importers, in their review of the market for 1926, report that a greater volume of business could have been done in 'Rhodesia' had supplies been forthcoming at prices the market felt they could pay. They continue: 'There is a considerable under-current of dissatisfaction at the high prices demanded for certain grades of Colonial, and shippers should always bear in mind that the

basis of the demand is the preference, and that this advantage is intended to be passed on to the public.' Here are words of warning to growers, the meaning of which is quite plain to influential people who are interested in growing operations in Rhodesia and who can see further than do individual growers.

"It is most necessary that the growers should pull with the manufacturers and not against them. The reason for this necessity is that there is a force outside the growers and outside the manufacturers, which is supreme. This force is the consumer. He knows the fact of a generous preference, and confidently looks for the cheaper tobacco which he gets from the Empire. If prices at the source go far to eclipse the effect of the preference on retail prices, the fabric of Empire tobacco culture is weakened.

"The sanest opinion is that which looks to the future. At the present juncture, when the taste of smokers is being educated to a liking for Empire tobaccos, it is essential that the effect of the preference should be fully felt on retail prices. Inordinate demands on the part of growers are against their own interests. Empire tobaccos do not depend ultimately upon any preference which may be continued or cut off according to possible political contingencies. They depend upon acceptability to the smoker—that is on quality and reasonable retail prices. If growers were to attempt to absorb the preference, which was specifically granted by Parliament as a rebate to the consumer, they would be not playing the game, the rules of which have been drafted, not by the merchants and the manufacturers, but by Parliament. We are too much in sympathy with the growers and too zealous for their success not to speak plainly to them. We have in the old days always helped in the fight for the preference. Now that success is attained, we—in common, we believe, with the majority of the trade—wish to see it operated on a just basis, and one which is consonant with an assured and permanent place for the Empire in the market."

The article contains two statements which call for some comment. For instance, we fail to see how the tobacco growers of this Colony can control the prices paid for their leaf by the manufacturers in England. It appears to us to be purely a question of supply and demand. The manu-

facturer will pay just what he considers he is able to pay and no more. Then the statement that the preference was specifically granted by Parliament as a rebate to the consumer. It was, we believe, the intention when the preference was granted originally, for a portion of it to be passed on to the producer, although in practice this has not materialised. Rather has the effect of the preference been to create a demand for Colonial tobaccos, and to this extent growers have benefited.

It would be interesting to know to what extent Rhodesian tobacco is being used in the popular Empire brands selling at 7d. or 7½d. an ounce in England. We have seen it stated that these brands contain inferior growths from parts of the Empire other than Nyasaland and Rhodesia, and that the best types of tobacco from these Colonies are retained for blending with American leaf in more expensive brands which are not labelled Empire. If this is so, then the manufacturer is not paying an exorbitant price for Rhodesian tobacco.

All the same there are certain factors which must be taken into account in the consideration of prices, and one is that, presumably as a result of the Imperial preference, American leaf is selling in England at a slightly lower figure than formerly. Another is that there is a very heavy crop in the United States, a large proportion of which is bright leaf. Nyasaland has a bumper crop this year, while Canada is yearly increasing her exports of tobacco to the Home market, most of which, it is true, is semi-bright and dark leaf. It is possible that these factors will have some effect on prices, and Rhodesian growers may have to accept less for their tobacco than was paid last year. Even so, there need be no fear that, providing quality is maintained, the margin of profit will be sufficient to make the growing of tobacco in this Colony a very profitable undertaking.

Commercial Poultry Farming in Rhodesia.

By GORDON COOPER, Essexvale.

Introduction.—Poultry farming on a commercial scale is of comparatively recent origin, but it is a branch of farming that has come to stay. The prospects for its development in Rhodesia are very bright. In the past the keeping of fowls on farms has been more in the nature of a useful and paying side-line, but in this case the question of costs and overhead charges scarcely entered. In the commercial plant, however, the question of costs is a most vital one. The profit per bird is a small one, so that the greatest care is needed to ensure a worth-while profit. Many persons in the past have given up poultry keeping through their not having the necessary experience in reducing costs.

Commercial poultry farming is a highly scientific business, and the rule of thumb must be relegated to the past. In a few cases sales of pedigree stock can increase the income, but this must be confined to a small minority of poultry keepers, and in the majority of instances the revenue will almost entirely depend on the production of commercial eating eggs.

For several years I have been building up my own plant and acquiring experience, and in view of the many letters I receive asking for advice I feel that detailed descriptions of my methods may perhaps eliminate in certain cases the acquisition of that knowledge by experience which is frequently a costly process. Needless to say, the methods described are those that I consider best suited to my own special conditions, and they would have to be modified or altered according to the circumstances of the individual. In addition, I would point out that further experience on my own part may quite radically change my present methods.

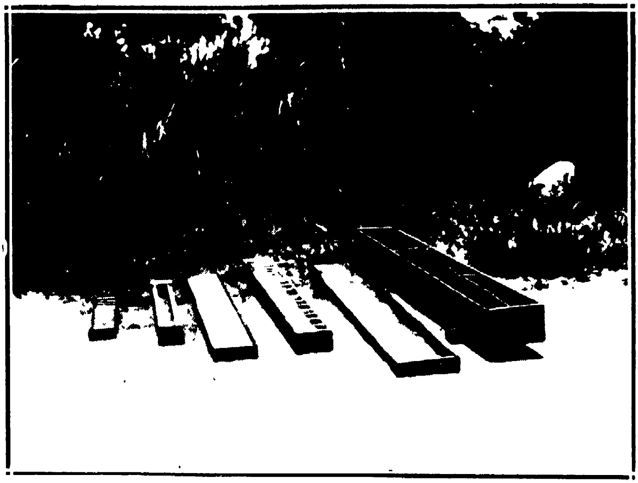


Fig. 1. Types of feed vessels for chicks and adult fowls.

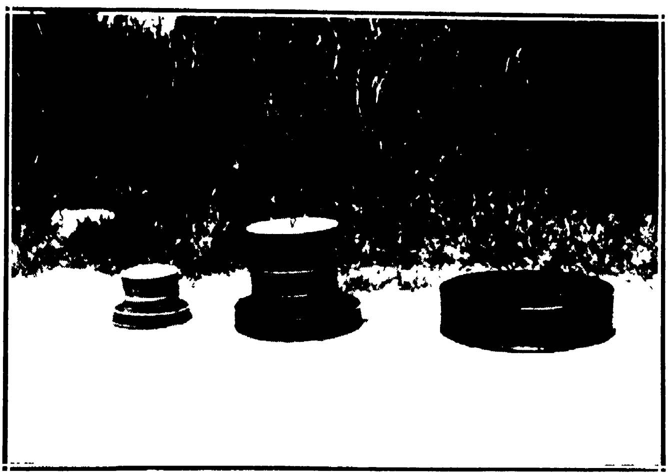


Fig. 2.—Types of drinking vessels for chicks and adult fowls.

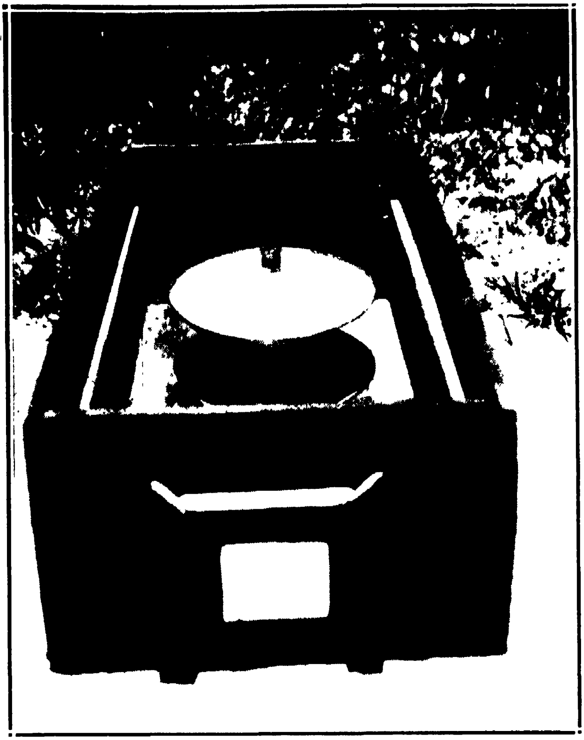


Fig. 3. Putnam lamp and brooder box.

Fig. 4.—Brooder for chicks over four weeks old, and Putnam brooder.

I would like to emphasise to intending beginners that, however great may be their aptitude and keenness for poultry farming, there is little prospect of success unless they also possess sufficient capital. Developing a farm never goes according to programme, and trusting to luck is dangerous. To build up a flock of, say, 2,000 layers takes three or four years, and in the meantime there are many expenses, foreseen and unforeseen.

The System.—My main aim in poultry farming has been to maintain and increase fecundity and to prevent disease. This can only be secured by unremitting observation and by having a system. System is necessary in order to secure the greatest possible economy in management, and observation is needed to maintain the system at the highest possible point of efficiency. The moment one relaxes or gets slack, accidents happen, but the development of an efficient system gradually eliminates many of those potential sources of human error.

The principles of my system are:—

1. I breed only from constitutionally vigorous stock.
2. I trap-nest all breeding stock before use as pullets in order to be certain of their performance.
3. Incubating is done in a big unit. Chick rearing is done in small units. Layers are kept in hundred-bird units.
4. All birds are fed on dry mash only. Birds and chicks are never coddled and all the stock run on free range.
5. Scratching litter is only used for special breeding pens and old layers.
6. Regularity in cleaning houses and disinfecting them is essential.

Breeding.—The eggs used for hatching purposes must come from the most rigidly culled stock. Every defect may be magnified a hundredfold. The breeding stock must be kept in the pink of condition, otherwise poor hatches and weedy chicks will result. I run both pedigree pens and flock matings. In the pedigree pens are placed birds of good type that have got good trap-nest records and which

can trace similar qualifications back for at least two generations on both the sire's and dam's sides. Great attention is paid to egg shape, weight and texture of shell. All hatching eggs are weighed. In the case of my best matings, the birds are trapped as hens so as to be absolutely certain that their chicks are from birds that possess a high hatchability factor. In some cases a pullet will have a good hatchability record, but as a hen she will fail. It would be dangerous to perpetuate such a fault.

I run ten hens to a cockerel in the light breeds and six hens to a cockerel in the heavies. The cockerels are removed from their matings two days in every week and specially fed. This increases the fertility. The cockerels are very rigidly selected. I may hatch out several hundred pedigree cockerels and cull these down to sixty. I ignore the bird's pedigree entirely in culling and only study its constitutional vigour. It is through this that I consider my freeness from disease is due largely. In the flock breeding pens I place about six cockerels to a hundred birds. Every breeder, irrespective of pedigree, must have laid at least 45 eggs of good weight and shape in 90 winter days.

The breeders are fed germinated oats and sour milk first thing in the morning, and at the same time a very light feed of grain is thrown in the litter. Shortly afterwards a green feed is given; as much as they can eat. At 4 o'clock a good handful of grain is given, followed by more green feed. About twice a week a little dry mash is given at mid-day. This method of feeding may not give the greatest number of eggs, but it secures high fertility, which is more important. The details of feeding will be described later on.

The birds are mated up the end of March and the last lot of eggs put in the incubator the middle of August. For my own hatching I prefer July and early August chicks.

Incubation.—Incubation is carried out by a mammoth 2,400-egg Glevum; in addition, I run two 600-egg Jubilees and a couple of smaller Tamlins. The mammoth machine burns anthracite coal. It involves a certain capital cost, but the great saving in running expenses soon pays for itself. The fire requires stoking once daily—a very simple operation—and all the eggs are turned automatically by handle in 30 seconds. Hatching results are extraordinarily

good, and the moisture and heat controlled in a very efficient manner. The machine is divided into 150 egg compartments, which can be started individually. The elimination of all handling of eggs and oil makes such a tremendous difference that I would never care to go back to the small oil machine again. In a season I only use a ton of coal, which will give an idea of the great saving in fuel cost alone.

I start up the incubator on 1st April, and during the coming season I anticipate to hatch out some 15,000 chicks, all of which, except 3,000, are sold as day-old chicks and are sent all over Northern and Southern Rhodesia, Portuguese East Africa and the Union.

A good incubator house is essential. I give a plan of my own house. The building is thatched, which keeps a very even temperature inside, and great care must be taken to secure efficient ventilation and freedoom from draughts.

So many trays are started up weekly, and I require about 1,200 eggs each week. Heavy and light breed eggs are kept in separate compartments. No egg under 2 ozs. is used, and they must be of good texture and shape. The eggs are turned thrice daily, but never cooled. On the eighth day I run a powerful electric torch under the eggs and remove infertiles, broken yolks and weak germs. Records are made of their origin, which in the case of trap-nested stock is shown by the hen's number being marked on the shell. This method of testing only takes a few minutes. Infertile eggs are sold for cooking purposes and the rest destroyed. The water trays are always kept filled with water. At hatching time extra moisture is supplied by having Beatrice stoves with half paraffin tins on them which have some water in them. The steam rises and gives this extra moisture which I find is essential to secure good hatching. I never open the drawer until the hatch is finished. Pedigree eggs are placed in pedigree cages on the eighteenth day, and on removal from the machine the chicks are toe-punched according to their pedigree.

While one frequently hears of the 100 per cent. hatch, the average runs much lower. I am quite satisfied if I can secure 66 per cent. of good healthy chicks from each hundred eggs placed in the machine. Both at the start and at the

end of the season the hatching is not so good as in June and July. Hatching eggs sent by rail will never hatch out as well as eggs that have not travelled.

Brooding.—We are extremely fortunate in our winter climate in Rhodesia. It enables us to raise chicks under almost ideal conditions. In other countries the mortality in chick-raising is considerable, but with us it is practically nil.

When the chicks are quite dry they are removed from the incubator and placed in small runs made of circular corrugated iron two feet in height. The ground is covered with coarse sand and a little fine charcoal thrown down. The chicks receive no food at all for 60 to 72 hours except sand and charcoal, and they get separated milk to drink. The first feed they get is fine chick grain, which is largely composed of best quality oat groats, chicken wheat and yellow mealies. On the sixth day they have placed before them all day Vitality Chick Starter Mash. They also get three feeds a day—early morning, noon and 4 p.m.—of chick grain. The mash is removed at 3.30 p.m. The grain must be fed in litter to make the chicks scratch. The chicks should go to bed with their crops full, and an examination of the litter will show if too much is being fed. About a week old they can be given finely chopped up green food. Chick size oyster shell, grit and charcoal should always be available. Types of feed and drinking vessels used are shown in Figs. Nos. 1 and 2. Cleanliness is essential, and I have every vessel cleaned with disinfectant daily. The runs are cleared out every other day and fresh litter put in and new sand. The ground is sprayed. If separated milk is available they should get as much as they will drink, and water in addition.

The chicks are put to sleep in cold brooders, which can be made out of paraffin or petrol cases with one side removed and made into a lift-off lid. A piece of sacking or dry grass can be put on the floor and cleaned daily. The corners should be rounded off to prevent crushing. For the first week about 50 to 60 chicks are placed in one box, for the second week about 40, and during the third week about 30. Great care must be taken to see that the chicks are never over-crowded, especially in August and September, when the nights are often warm. A visit at night will soon show

Fig. 5.—Pullet house.

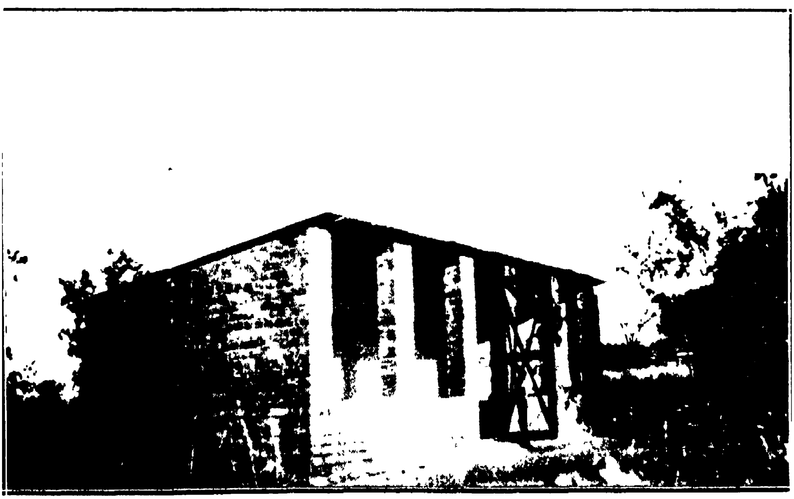


Fig. 6.—Trap-nest house.

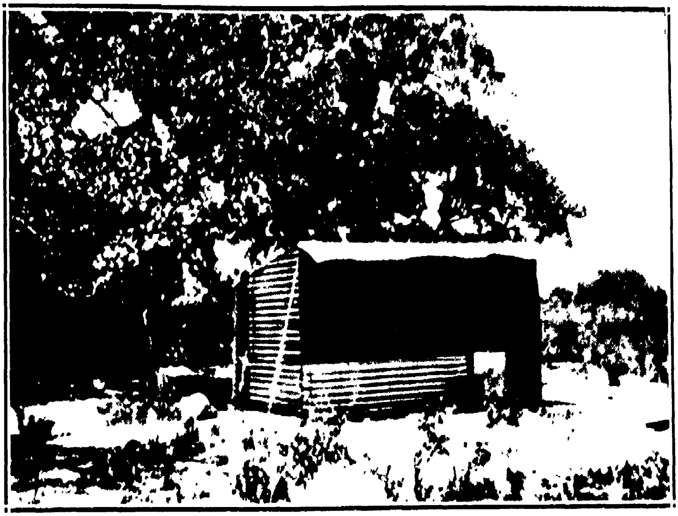


Fig 7. Commercial laying house

Fig. 8.—Broody coop and trap nests.

if the youngsters are comfortable. I usually put these boxes inside for two or three days, but after that they remain in the runs at night time. During "macassa" or "guti" weather it is impossible to keep the chicks in open runs, so the youngest are placed in small shelters with open fronts and provided with Putnam brooder lamps (Fig. No. 3), which I have found to be very effective. The older chicks simply require the shelter from the cold wind. It is important to keep the chicks warm, but they must get fresh air and light, otherwise they get torpid and will die.

At about four weeks old the chicks are removed into wire runs in the orchard and are put into open-fronted brooders, as shown in Fig. No. 4. It will be seen that these are easily made from Flag cigarette boxes. They have no floor, but an old sack is put down.

From 6 to 12 weeks old the chicks get a coarser chick feed and their mash becomes Vitality Growing Mash. The grain feed is now only fed first thing in the morning and again at 4 p.m. The chicks run on free range in the orchard. As before, the very greatest care is taken regarding cleanliness, and too much stress cannot be laid on this point.

As soon as sex is discernible I separate cockerels and pullets. Pedigree cockerels are placed on free range in the cockerel rearing ground and the non-pedigree cockerels killed or sold as broilers. The pullets at about three months old go out to the pullet growing range.

Colony Houses.—The pullets on being removed to the colony houses are taken out in the evening, placed in their new house and left there all the next day and are let out the following morning, by which time they know their house and do not wander off. These colony houses are simple houses, as seen in Fig. No. 5; their measurements are 8 ft. x 4 ft. and 5 ft. high in front and 4 ft. 6 in. at the back. At the start the birds do without perches, but when they are of a suitable age perches are put in. The birds are fed in the same way as the layers. When the birds show signs of coming on to lay they are moved into the laying houses. Culling is carried out with any birds that look at all weedy.

Cockerel Houses.—The cockerels are kept in the same way as the pullets. Culling is regularly carried out and

the culls sold for eating. At one time I practised caponising the heavy breeds and cross-breds and was able to produce a nice table bird, but found that it did not pay for the time and trouble, as the public out here are not yet educated up to the value of a good table bird. It might quite well pay some person who specialised in it, but with other interests here I decided to give it up.

Laying Houses and Management.—On this farm the laying houses are of three types. There are the small breeding pen houses; these are made of brick and iron roof. The dimensions are 6 ft. x 6 ft., with 6 ft. high in front and 5 ft. 3 in. at the back. The front is built up in brick for 2 ft. and then 2 ft. wire netting above. The floors are of brick grouted in cement.

The trap-nest houses are also made of brick, and their plan is shown in Fig. No. 6. The commercial laying houses are shown in Fig. No. 7. They are very simply made, being 12 ft. x 8 ft. and 6 ft. high in front and 5 ft. 6 in. at the back. Inside the house there are only the perches; the floor is covered with sand, which is swept out weekly and new sand put in. Each house holds 100 birds. There is a 2-ft. overlap in front, which keeps out nearly all the rain. The food, water, oyster shell, charcoal and laying nests are all placed outside under the shade of adjoining trees. The grain is fed to the birds on the ground; no litter is used, as in my opinion it is simply a breeding place for disease, besides involving the use of a good deal of extra labour. Birds on free range get plenty of exercise to keep them in good health, which is the most important thing. No other animal wastes valuable energy scratching away for its feed. No flint grit has been fed on this farm for years; it is quite unnecessary, as the gizzard of the fowl grinds all the feed, not the grit. Charcoal helps to purify the blood. The mash is put in troughs, as shown in Fig. No. 1. These are easily made out of motor car case and flat iron. Dimensions can be 5 ft. long, 5 in. wide and 5 in. deep. A wire is put down the centre to prevent the birds getting into the mash. The bottom of the trough and the lid are made of iron. Two small slats are fixed on the bottom to keep the trough just off the ground. The lid is made easy fitting and about 2 in. deep so that it can

be used for feeding green food and germinated oats. The advantages of this trough are its simplicity and cheapness. It is easily closed and it is rat and rain-proof. Such a trough will serve 50 birds, so two troughs are required for each house. The drinking vessels are shown in Fig. No. 2; such troughs are 20 in. in diameter and 4 in. deep. I coat them with Jetalina and they will last for years. These drinking vessels are easy to clean and are much preferable to the paraffin tins so often used, and are much cheaper in the long run. Houses that contain heavy breeds or cross-breds are also supplied with a broody coop (Fig. No. 8) consisting of a large box with slats for the floor, wire netting round the sides and a wood top with a lid in the centre. This is placed on bricks to allow air circulating underneath, and a couple of days in this coop soon cures a bird of broodiness. The perches are made of five lengths 11 ft. 6 in. long of 2 in. x 1½ in. fixed on to three motor car boards to make a framework. This framework is hinged with three hinges on to a back support, which is fixed on to three circular poles sunk into the ground. The front of the perches also rests on three poles. In the centre at the front a plank is hinged on to the under side, and when the front of the perch is lifted up this plank falls down and makes a rest. This is most convenient for cleaning the houses or moving about inside. When the perch has to be lowered all that has to be done is to push the end of the leg forward and lower the perch on to its supports.

All laying birds have the mash before them all day till 3.30 p.m., when the mash boxes are closed. At 4 p.m. the birds are given their grain feed. This is always fed by myself personally, as by regulating the grain feed according to the requirements of the birds one can do a lot to keep them in the best laying condition.

About the middle of March I mate up my breeding pens and also place the pick of the pullets in the trap-nest houses. Their records start on 1st April and continue until the end of August, by which time I have a pretty good idea as to their capabilities. The winter layer is the bird that pays, and it would not pay me to press for eggs during the cheap egg months, as the birds would not be in such good condition for breeding the following year. Each bird

placed in a trapping house is given a numbered ring on its leg. On laying an egg its number is marked on the egg along with the date. Each evening the birds laying are recorded in a special book. Thrice monthly all eggs are weighed and scored for shape, texture and colour. Each pullet that lays a 2-oz. egg has three or four of its eggs placed in the incubator, and records are made of its fertility and hatchability. Some birds never lay an egg that hatches; other birds score 100 per cent. hatchability, and as this factor is inheritable, it is a very important point. All birds that fail in type, even should they possess a fine record, are either put into a commercial laying house or used in cross-bred matings.

The wonderful results that have been achieved in Great Britain with cross-breds induced me to breed some birds which are a cross between Rhode Island Red males and Ancona females. I have kept accurate records of their laying and have found them to be wonderful layers. Birds now in their third year are still laying heavily. Sickness is practically unknown. It is important to note, however, that in breeding one must use good birds on both sides; it is no use mating up inferior birds and expecting good results. One slight objection that I have experienced in breeding is that the fertility factor is not so good as with one's ordinary pens.

Feeding and Water Supply.—I use dry mash from birth onwards and find it a great saving in labour. The mash troughs hold about three to four days' supply. Animal feeding in general and poultry feeding in particular is a science which is only in its infancy. We are passing through the stage of breaking down old prejudices and looking towards a broader and more scientific aspect of the subject. In the past our knowledge was limited to the school of experience; certain feeds and combinations were found to give better results than others without our knowing the reason why. Modern scientific research is paying close attention to such questions as fibre, mineral salts, vitamines, etc. I cannot go into this matter here, but I will pass a few comments on the matter of feeding.

In my opinion the most vital thing in poultry feeding is to be able to tell a good sample of food from a bad one.

It is quite possible to have a good feeding formula and yet get poor results. I always stress the fact that the best results can only be obtained by the best feeding, and it is only by the best results that the best profit can be secured. I have seen many people who consider this good feeding policy nonsense, but later results always confirmed my view. Too much fibre in the shape of bran and lucerne meal is very frequently fed. A heavy layer requires a concentrated ration if she is to keep up her supply. Another point in connection with the feeding of too much bulk is that it is undoubtedly the cause of many of the diseases that fowls are subject to. Pollards are one of the best feeds, but the sample must be a good one and not like sawdust. Ground nut meal, which consists simply of crushed ground nuts, is a most unsuitable feed, as it is very high in fibre and oil.

In the grain ration crushed maize is an excellent feed up to about 50 per cent., but if possible some smaller grain should be added. In most crushed grain there is quite a considerable amount of meal and chaff; this is wasted unless the grain is sieved and winnowed. With a number of birds it is extraordinary how much waste can be removed with a winnower and then fed to pigs or cattle.

Birds want plenty of fresh, cool, clean water. Great saving in labour is effected by having a simple form of pipe water supply laid on to the vicinity of the laying houses, as otherwise the carting round of water from a distance occupies far too much time. The drinking vessels are washed out each afternoon and fresh water put in. Twice a week the native takes round a weak solution of disinfectant and washes the vessels with it. The mash troughs are also disinfected at regular intervals.

As regards medication of water, I am not a believer in it, especially as regards putting permanganate of potash in it. When I consider the birds require it, I may give them some Epsom or Glauber salts. After moulting, or if the birds look a bit off colour, I put some Douglas Mixture in the water. Should there be any colds about, I have rather an elaborate disinfectant mixture which I find very effective in putting a stop to them and also to any more serious sickness.

Green food must be fed plentifully, especially during the winter months. Green lucerne is an excellent food; also lettuces and cabbages. I also find that the feeding of germinated oats from January to August has not only a very favourable effect on egg flow, but it keeps the birds in good health and increases fertility.

The method of preparing germinated oats is to weigh out 3 lbs. for each hundred birds to be fed, and place it in a paraffin tin. On the top pour warm water and leave for twelve hours to get well soaked. The next day the oats are turned into tin No. 2, which is provided with small holes to let any surplus water drain out. At the same time another lot of oats are put to soak in tin No. 1. The following day the sprouting grain from tin No. 2 is transferred into tin No. 3, and the soaked grain in tin No. 1 put into tin No. 2. This process is kept on daily, and about seven tins are required. When the first lot has developed short milky sprouts—not green—they are ready to feed, and if milk is available they should be mixed with an equal weight of sour separated milk, left soaking over-night and fed first thing in the morning.

Feed Stores, Egg Handling, etc.—While makeshift stores may serve all right at the start, it will be found that proper buildings in which to store grain, boxes, etc., are essential, both for the saving in time and for convenience.

I have one main granary in which the various feeds are kept before mixing. Near the breeding and trap-nest houses I have a feed store fitted up with brick bins which are coated with cement. These bins do away with all sacks and enable me to keep several tons of feed ready mixed up. Adjoining the feed store I have a small room in which I germinate the oats. Amongst the commercial laying houses I have another feed store, so that the natives never have to carry feed any distance.

When large numbers of eggs are being handled it is necessary to have a large egg room in which eggs can be stored, cleaned and packed. It may also be necessary to preserve eggs during the plentiful season when they are cheap, and sell at a higher price in the scarce months.

A lean-to shed in which to place brooders, coops, etc.,

when not in use will soon pay for itself, as exposure to the sun and rain causes more deterioration than all the actual use.

My eggs are collected twice daily and placed in racks in the egg room. Those that are dirty are cleaned with a damp cloth and monkey brand soap. All clean eggs are then packed away in 30-dozen boxes and twice a week sent to market.

During the months when breeding is not in progress all male birds are removed from the hens so as to ensure the eggs being non-fertile; this ensures better keeping qualities.

Disease.—By breeding right, by feeding right, by housing right and by maintaining close observation of one's birds, disease should cause very little trouble. Healthy birds may have minor ailments, but they should never wreck a concern, as is frequently the case where breeding of birds with poor constitution is usual.

There is a theory preached that if a bird goes sick it should be "axed." This, in my opinion, is wrong. There are many minor ailments which a few minutes' attention and a pennyworth of medicine will soon put right without the bird being any the worse. Colds, crop-bound, bumblefoot, chicken-pox, slight liver sickness, etc., are easily treated. If, however, a bird is badly sick, it pays to kill and burn the carcase, as not only does it not pay to devote the time to treating the bird, but such a bird when cured is a menace to the rest of the flock, as she will frequently get ill again and quite likely disseminate the germs.

When there is sickness amongst birds the only thing to do is to find out the cause of it and to remedy it. Should the trouble be of an infectious nature, flock preventive treatment must be carried out. This can best be done by medicating both the mash, which in this case must be fed wet, and the drinking water. Litter if used should be burnt and the houses, mash troughs and drinking vessels disinfected daily. It may be necessary to handle the birds and dip their heads in a weak solution of disinfectant every other day.

Should any sickness break out, besides taking every means to prevent the spread of infection, it is also necessary to keep the birds in a good state of health, as a bird that

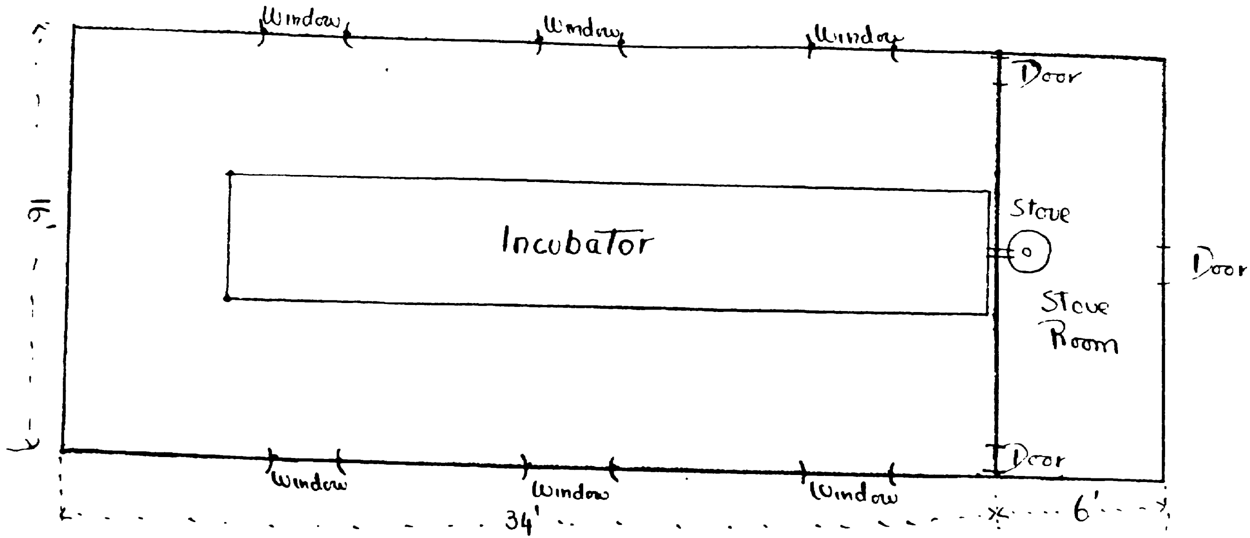
is at all run down is an easy prey of disease. In such cases I would recommend the addition of a tonic to the wet mash. This will help to keep them on the feed, because once the birds get off their feed there will be no end of trouble.

The Business Side.—Having produced the goods efficiently, it is equally important to sell them efficiently. This is frequently a difficult matter, and yet at the same time a most important matter. The matter of buying foodstuffs in the cheapest market is also a case where profits may be largely increased. In a flock of 2,000 birds 1s. per bird saved in the food bill represents £100. Likewise with a flock average of 12 dozen eggs per bird an extra 2d. per dozen eggs shows an increase of receipts for the year of £200. In both cases a saving or extra receipt represents extra profit. In marketing eggs everyone must study his own local conditions. A big producer will usually find it best to market the eggs wholesale rather than to find small customers.

A point that many persons forget is the matter of overhead costs. With a small number of birds the overhead costs are usually so heavy per bird that no profit is left. The overhead costs are not much greater with 2,000 birds than with 200. I find myself that between 2,000 to 3,000 birds is about as much as one can conveniently handle. This may represent, with cockerels and growing stock, an actual flock of over 4,000 birds.

We often hear that native labour is inefficient, but I have found that by eliminating by labour-saving devices much of the work and paying a good wage to good natives I can run my flock with three natives; during the trapping and chick-rearing season I take on two more natives. These natives have to clean the houses, water and feed the birds and mix up the food. They are not overworked, but they have to do their work efficiently. If I did not use labour-saving devices I should require six natives, and even then I would have a great deal more trouble and the work would not be done so well.

Finance.—Finance is the keystone of commercial poultry keeping. Unless satisfactory profits can be made, the concern cannot carry on. Profits are the acid test of success.



Plan of incubator house.

Imaginary profit and loss accounts can be shown to prove how easy it is to make poultry pay, but they invariably fail to allow for the purchase of experience, which is the rock on which so many embryo plants have failed. Any beginner would save a lot of money by going as a pupil on a well-run plant.

As the cost of experience must vary with individuals, it is impossible to estimate it. The actual capital outlay to attain a 2,000-bird plant would be spread out over three or more years. Unless one was very experienced, it is the best plan to develop step by step.

In my own case experience has often been dearly bought. I would certainly never advise anyone starting, and who had to depend solely on eggs for their livelihood, to begin unless they had at least £1,000 capital. When one considers that at the present time in Rhodesia there are not half a dozen paying commercial egg farms, it is interesting to consider the reason. The reason, I think, in those cases where aptitude and common sense have been present, lies almost entirely in the poultry keeper not having enough capital to last out the course until he had acquired the requisite experience.

In towns where all grain and feed have to be bought I do not see how profits can be made unless at least 1s. 9d. per dozen is secured as an average for eggs sold. Where grain is grown this net return can be reduced slightly.

Conclusion.—Two questions which I am frequently asked are which are the best breeds for egg laying, and also which is the best method of building up stock.

As regards breeds, there is no best breed; it is the strain that counts. A good laying strain of a little known breed is better than a poor strain of a popular breed. Individual choice must decide the question, but it is obvious that a lot of time can be saved by fixing on a breed which has already been well developed. In Rhodesia White Leghorns and Anconas have proved their worth in the light breeds, and amongst the heavies are Rhode Island Reds and Australorps.

As regards the best method to start, it is a difficult problem. From the purely commercial point of view I think

that if reliable chicks could be obtained I would eliminate all breeding and buy day-old chicks. By this method one gets the chicks in batches just as required; one is saved all the trouble and worry of hatching, and in many cases getting bad results, and it is then possible to sell all the eggs just at a time when they are fetching good prices for eating purposes.

In conclusion, I would like to point out that although I have the greatest faith in the possibilities of the poultry industry in Rhodesia, the beginner will frequently experience set-backs, disillusionments and disappointments which always await the farmer, and the novice in particular.

From the start do not expect too much from your investment. The wonderful stories that you hear about Mrs. So-and-So making £100 a month from her fowls are invariably extremely exaggerated. In calculating your hatches be happy with 60 per cent. average, and if you do better you will be pleased. In chick rearing, losses may be unavoidable, so be on the safe side and reckon on having one laying pullet for every five eggs placed in the incubator. In this Colony losses must be experienced from vermin, hawks and theft. Do your best to reduce them.

Finally, if in doubt about any detail of feeding, disease, etc., consult someone who knows, and not the neighbour who thinks he knows. Again, don't chop and change about. Get a good system and stick to it.

The Poultry Expert appends the following comments:—

I have read with interest Mr. Cooper's excellent and useful article on commercial poultry keeping. There are, however, a few points on which I do not see eye to eye with him.

The profits from poultry keeping are good if good layers and healthy birds properly treated are used; the prices of foods are moderate, and the price of eggs a fair one.

There is no hard and fast rule for the number of hens mated to a cock; much depends upon the season of the year, the breed and the size of the run.

Certainly no eggs under 2 ozs. should be incubated. I prefer to see eggs over 2 ozs. used; there is then more likelihood of the progeny producing all 2 ozs. and over. If 2 oz. eggs only are set, the progeny are likely to produce many under 2 ozs.

Although I am a stickler for strict cleanliness, I do not think it is absolutely necessary to put in fresh litter and sand as frequently as Mr. Cooper recommends; it is a waste of time and labour to do so. I am also a strong believer in scratching litter; the birds must have this exercise to keep in good health and prevent over-accumulation of fat; it is natural for a hen to scratch for her food. If one watches young chickens as soon as they are hatched and dry one will notice they start scratching almost at once. Scratching litter there must be, but it must be kept clean and renewed as often as necessary.

With regard to grit, this in my opinion is absolutely necessary; without it proper digestion of the food cannot be accomplished, and the result is all sorts of intestinal troubles. Every wild bird uses it, and if a fowl cannot have access to it she will use even glass or china if these are available in its stead.

The dry food and green food hoppers used at the egg laying test are made from whisky boxes (two from one whisky box). I find these excellent and very cheap. Water and milk vessels are made from Mobiloil tins or petrol tins; these again are very serviceable, easily cleaned and cheap; as soon as they commence to leak they are converted into grit, charcoal and shell hoppers. Cheapness, with efficiency and saving of labour in cleaning appliances, should be studied on every poultry farm, and as far as possible all appliances, etc., should be home-made.

I am not a believer in cross-breds; I know there is a craze for them in England at the present time. Those recommending them say that they are stronger, more healthy and better layers than pure-bred birds. If pure-breds are properly selected for health, strength and vigour, and also for laying qualities, one is bound to reproduce the same qualities in the progeny, with the following advantages:—(1) That we have pure-breds which can be sold at good prices as breeding stock, whereas cross-breds can only be

sold for laying and eating; (2) a flock of uniform pure-bred birds is much more attractive than one consisting of all sorts of shapes and colours; (3) one can accomplish so much more with pure-breds from a breeding and heredity point of view than from cross-breds.

With reference to the best method of commencing poultry keeping, I am emphatically of the opinion that a pen of breeding birds is the best. The price paid for a breeding pen may not be greater than that paid for 100 hatching eggs, certainly not greater than for 200. At the end of the hatching season the number of stock from one breeding pen will be greater than from 200 hatching eggs, and the owner also has the breeding pen and its progeny. The same applies to day-old chicks.

With reference to there being only about half a dozen paying commercial poultry plants in Rhodesia, I know (and naturally am in a position to know) of at least 24 such good paying concerns, each of which is increasing most satisfactorily. Others have started in a big way and dropped out because they started in too big a way and did not conduct their operations on proper lines.

There are one or two other points in Mr. Cooper's article with which I do not fully agree, but the above are the most important ones and points which I am constantly impressing upon poultry keepers.

ARTHUR LITTLE,
Poultry Expert.

The Feeding of Dairy Stock in Southern Rhodesia.

(Continued.)

PART II.

By T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.

Compounding Rations.—In the feeding of dairy cows there are many factors to be considered; some of these have been discussed in preceding chapters, and it will be sufficient here to mention a few of the main considerations which should be studied if successful feeding is to be practised and the best results obtained.

Skill in feeding cows is measured very largely by the ability of the dairy farmer to apply such knowledge as has been found by experience and experiment to produce the best results, and the success or otherwise of any system of rationing depends in no small degree on the knowledge of the farmer concerning the fundamentals of correct feeding.

In order to practise an intelligent and profitable system of feeding it is essential that the dairyman should have a sound knowledge of the following:—

1. The requirements of a dairy cow.
2. The nature, composition and value of various feeds.

The Requirements of a Dairy Cow.—The general requirements of a dairy cow have been outlined in a previous article in this Journal, where it is shown that certain nutrients—protein, etc.—are required daily by the animal for maintenance and milk production. The actual quantities,

however, of these nutrients required daily by dairy cows for these two purposes can be ascertained fairly accurately by means of "feeding standards."

The following is one form of feeding standard, and is presented in order to indicate the approximate amounts of the various nutrients required daily by milking cows:—

FEEDING STANDARD FOR DAIRY COWS.*

Daily requirements.	Digestible crude protein. lb.	Total digestible nutrients. lbs.
For maintenance of 1,000-lb. cow ...	.70	7.925
For each lb. of 3 per cent. milk add	.052	.286
For each lb. of 3.5 per cent. milk add	.055	.316
For each lb. of 4 per cent. milk add	.06	.346
For each lb. of 4.5 per cent. milk add	.063	.376
For each lb. of 5 per cent. milk add	.067	.402

In the above table the requirements of the animal are expressed in terms of digestible protein and total digestible nutrients. The total digestible nutrients contained in any feed can be calculated by adding together the protein, carbohydrates and fat multiplied by $2\frac{1}{4}$. By means of this table it is possible to calculate the amount of protein, etc., required daily by any dairy cow, provided that her daily production of milk is known.

For example, the daily requirements of an 800-lb. cow producing two gallons of milk testing 3.5 per cent. butter fat are calculated as follows:—

A 1,000-lb. cow requires daily for maintenance:—

Digestible protein ... ... .70 lb.

Digestible nutrients ... ... 7.925 lbs.

An 800-lb. cow therefore requires daily for maintenance:—

1. Digestible protein ... $\frac{.70 \times 8}{10} = .56$ lb.

2. Digestible nutrients ... $\frac{7.925 \times 8}{10} = 6.34$ lbs.

*Adapted from Modified Wolff-Lehmann Feeding Standards for Dairy Cows (Henry and Morrison, 17th edition).

In addition to this the 800-lb. cow requires .055 lb. of digestible protein and .316 lb. digestible nutrients for every pound of milk produced daily. The daily milk yield is two gallons (20 lbs.), and the extra amount of protein, etc., to be added to the maintenance allowance for this quantity of milk is therefore:—

1. Digestible protein ... ... 20 x .055 = 1.10 lbs.
2. Digestible nutrients ... ... 20 x .316 = 6.32 lbs.

The nutrient requirements of this cow can be tabulated as follows:—

800-lb. COW PRODUCING 20 lbs. OF 3.5% MILK DAILY.

Daily requirements.	Digestible crude protein. lbs.	Total digestible nutrients. lbs.
For maintenance of 800-lb. cow	.56	6.34
For 20 lbs. (3 galls.) 3.5 per cent. milk	1.10	6.32
Total	1.66	12.66

This cow requires, therefore, rather more than 1½ lbs. of digestible protein and about 12½ lbs. of digestible nutrients daily to maintain her body and to produce two gallons of milk.

Nutritive Ratio.—As has been mentioned elsewhere, in a ration for a cow of this kind a certain balance should be maintained between the amount of digestible protein present and the carbohydrates and fat. This relation between the nutrients is known as the nutritive ratio, and in the above case, where the animal should receive 1.66 lbs. of digestible protein and 12.66 lbs. of digestible nutrients, the ration would have a nutritive ratio of 1 to 6.6. This is calculated as follows:—

$$\frac{\text{Digestible nutrients} - \text{Digestible protein}}{\text{Digestible protein}} = \frac{12.66 - 1.66}{1.66} = 6.6$$

The nutritive ratio therefore is 1 to 6.6. The nutritive ratio of any feed, the composition of which is expressed in terms of digestible protein and digestible nutrients, can be calculated in a similar manner.

On referring to the feeding standard presented it will be seen that to all intents and purposes the average cow requires daily about ¾ lb. of digestible protein and 8 lbs. of digestible nutrients for body maintenance, plus an additional ½ lb. of protein and 3 to 4 lbs. of digestible nutrients for every gallon of milk produced daily. If these figures are borne in mind they should suffice for practical purposes, and the average dairyman need not worry too much about feeding standards, which, after all, have their limitations and should be regarded chiefly as guides in feeding and compounding rations, to be supplemented by experience and good judgment.

Dry Matter.—The amount of dry matter required daily by a dairy cow varies considerably; a dry cow may receive about 15 lbs. daily, while twice this amount would hardly be sufficient for a cow producing five gallons of milk. As a rough guide to the amount of dry matter required, the following may be adopted:—

A 1,000-lb. cow requires about 20 lbs. of dry matter daily, plus an additional 2½ lbs. for every gallon of milk produced.

A 1,000-lb. cow producing three gallons of milk daily should receive, therefore, 20 + 7½ = 27½ lbs. of dry matter daily. As far as possible two-thirds of the dry matter contained in the ration should be supplied in the form of roughage and one-third as concentrates.

Mineral Matter.—It is hardly possible to over-estimate the importance of mineral matter in the diet of dairy stock in a country like Rhodesia, where the soils and natural pastures are generally deficient in bone-forming substances. Apart from the fact that mineral matter is essential for bone formation, milk production, etc., there is every reason for believing that an insufficiency of these substances in the ration of a cow is a possible cause of failure to breed regularly, and even sterility. For young growing stock, dairy heifers and milking cows bone meal is essential and should be fed in liberal quantities, as elsewhere described. It is frequently convenient and perhaps preferable to feed bone meal with the concentrate portion of the daily feed, and wherever possible this should be done, as the animals will then receive an allowance of mineral matter every day.

Sterilised, finely-ground bone meal should be mixed at the rate of 3 to 5 lbs. for every 100 lbs. of grain. The necessity for providing salt and a supply of clean, cool water for drinking purposes has already been emphasised.

The Nature, Composition and Value of Feeds.—In planning rations for his dairy cows it is essential that the farmer should have a thorough knowledge as to the composition and feeding value of the various common foodstuffs.

The composition of the various crops commonly grown on Rhodesian farms can be ascertained from the "Analysis of Feeds" attached to this article. In this table the composition of the different foodstuffs is expressed in terms of digestible crude protein and total digestible nutrients to correspond with the terms in which the requirements of the animal are expressed in the feeding standard previously mentioned. The total dry matter contained in each feed and the nutritive ratio are also given. For example, the table of analysis shows that cotton seed has a nutritive ratio of 1 to 5, and contains in 100 lbs.:—

90.6 lbs. of dry matter.

14.5 lbs. of digestible crude protein.

89.2 lbs. of total digestible nutrients.

A further study of the table reveals the fact that the common cereal grains—maize, kaffir corn, oats, barley, etc.—contain very little protein. Leguminous seeds, on the other hand—cowpea, velvet bean, ground nuts—have a fairly high protein content, while by-products, such as ground nut cake, etc., are extremely rich in this nutrient.

Of the dry roughages, the leguminous hays appear to be the best sources of protein, while feeds, such as veld hay, maize stover, etc., supply very small amounts of this nutrient.

The fresh green roughages and succulents in general have a low protein content, owing chiefly to the relatively large amounts of water that they contain. It should be remembered, however, that succulent feeds have a value not indicated by chemical analysis. These feeds are palatable, laxative, easily digested and stimulate milk production.

It will be noted also that feeds such as veld hay, maize stover, etc., have a very wide nutritive ratio. Legume hays, on the other hand, are far better balanced roughages and have a fairly narrow nutritive ratio. Cowpea hay, for instance, has a nutritive ratio of 1 to 4.8.

On studying the table the difference between roughages and concentrates becomes at once apparent. Roughages are bulky feeds supplying a relatively small amount of total digestible nutrients. Concentrates are less bulky, contain less fibre and furnish a greater proportion of total digestible nutrients.

The futility of attempting to provide a balanced ration for dairy cows from feeds such as veld hay, silage and maize meal is also apparent. A ration for a cow in milk should, as is stated elsewhere, have a nutritive ratio of about 1 to 6 or 1 to 7. Maize meal has a nutritive ratio of 1 to 11 and veld hay has a ratio of 1 to 29. It is manifestly impossible, therefore, to compound a ration from these feeds that would be suitable for a cow in milk.

The dairy farmer would be well advised to study these feeds and to make himself familiar with their general composition, feeding value, etc., and having this knowledge in mind he should then study the possibilities of his farm for the production of these crops, and plan his rotations so that from the crops grown on the farm, supplemented when necessary by purchased feeds, it will be possible to provide balanced rations for his stock at minimum expense.

Having a sound knowledge as to the value of the different feeds and the nutrient requirements of his dairy stock, the farmer is then in a position to compound suitable rations for his herd. Before proceeding to discuss the feeding of roughages, etc., it may be advisable to say a few words on economical feeding.

Economy in Feeding.—The main object of the dairyman is profit, so that due consideration should be paid to cost of feeding. All the roughage required should be grown on the farm, and as far as possible an attempt should be made to supply all necessary concentrates from the same source.

As a rule it is the latter which have to be purchased, and in buying concentrates it should be borne in mind that

the market price of any particular feed is no indication of its value to the individual dairyman. The value of any feed to the farmer depends largely on the nature and composition of the other feeds which he has at hand. For example, purchased concentrates such as monkey nut cake are not indispensable as cow feed to the dairyman who has an abundance of good leguminous roughage such as cowpea hay. Roughage of this description can be economically supplemented by a mixture of farm-grown grains such as beans, maize and monkey nuts. On the other hand, a farmer whose roughage consisted chiefly of low protein feeds such as veld hay, maize stover, etc., would be compelled to purchase concentrates such as ground nut cake to make up for the deficiency of this nutrient.

The aim of the dairyman should be to market a large portion of the crops grown on his farm through his cows, but it should be borne in mind that the kind of crops grown and the way they are fed has a lot to do with their ultimate value when marketed as dairy products, and that as far as possible the dairyman should avoid sending good crops to market through poor cows.

Frequently it is not the fault of the cow that she fails to give a larger return for the feed she receives. An animal may be fed on large quantities of veld hay, silage and maize meal and yet produce very little milk. A ration consisting of these feeds is not suitable for milk production, and yet it costs money to grow these feeds. The animal does not receive sufficient protein—she is, in fact, under-fed in respect of this nutrient—and her production is limited to the amount of milk that the protein supplied in the ration can produce.

The dairyman, in this case, is supplying the cow with a poor ration at high cost and receiving very little in return.

In many cases an apparently costly feed is relatively cheap. Ground nut cake at £8 per ton would appear to be expensive, and maize meal at 10s. a bag fairly cheap food; yet, regarded as a source of protein, ground nut cake would supply this nutrient at 2d. per lb. and maize meal at about 8d. per lb.

The dairy farmer should bear these facts in mind and remember that it is not enough to supply cows with plenty of

feed in quantity without giving some consideration to the kinds and quality of feeds used.

Feeding Roughages.—The dairy cow uses more rough feeds and gives a greater return for them than any other farm animal. Once this fact is appreciated, and the economy of feeding plenty of good roughage realised, the dairyman will find that his whole feeding problems are to a large degree simplified.

It should be the aim of the farmer to supply his cows with an abundance of good dry roughage and succulent feed; and as far as winter feeding is concerned, the basis of the roughage part of the ration should be a succulent feed and a legume hay. As far as these two classes of roughage are concerned, the Rhodesian dairyman has a choice of several feeds.

As succulent feeds, maize silage, sunflower silage and sweet potatoes or pumpkins can be grown; while legumes such as the dolichos bean, velvet bean, cowpea and monkey nut furnish excellent hay.

Other hay crops can, of course, be grown; in fact, it is advisable to grow a variety of hay crops. Veld hay, cut at the right stage and properly cured, teff hay and Sudan grass hay, oat hay, etc., are all valuable for feeding and have their place in a cow's ration. The one fact that the dairyman should get firmly established in his mind is that for economical feeding the roughage should consist chiefly of a succulent feed and a legume hay. It is desirable, however, that the roughage should have a certain amount of variety, and it is here that hay crops such as teff, oats, etc., serve a very useful purpose.

It is hardly possible to over-estimate the value of a legume hay in the winter ration of a dairy cow. Legumes are cheap sources of protein, the food nutrient so essential for maintenance and milk production; and when it is borne in mind that the majority of the feeds commonly grown on Rhodesian farms are deficient in protein, the importance of a leguminous crop is at once apparent. For example, 30 lbs. of maize silage and 15 lbs. of cowpea hay supply almost as much digestible protein as a ration consisting of 30 lbs. of maize silage, 10 lbs. of veld hay, 3 lbs. of maize

meal, 2 lbs. of monkey nut cake and 1 lb. of ground dolichos beans. There can be no question as to which is the cheaper of these two rations.

In the feeding of roughages the dairyman should follow a very simple rule: feed all the roughage and succulent feed that the cow will clean up. As a rule a cow will consume about 2 lbs. of dry roughage, or 1 lb. dry roughage and 3 lbs. silage, for every 100 lbs. live weight. A 1,000-lb. cow therefore could be reasonably expected to clean up about 30 lbs. of silage and 10 lbs. of hay.

While feeds such as hay, silage, etc., can be fed to the limit of the animal's appetite, the same does not hold good for certain succulent feeds. Pumpkins should not be fed too heavily, and it is wise to limit the quantity of this food supplied daily to about 25 lbs.

Root crops such as sweet potatoes are fed liberally, but the farmer would be well advised in feeding succulents of this description to regulate the amount fed according to the following rule: The dry matter supplied by root crops should not exceed one-third of the total dry matter contained in the ration, i.e., a cow receiving 30 lbs. of dry matter daily should not receive more than 10 lbs. of this in the form of root crops.

Feeding Concentrates.—A cow of more than average production cannot maintain her milk yield on roughages alone; feeds less bulky and more concentrated in character are required, and the chief purpose for which these concentrated feeds are fed is to supply the extra amount of nutrients required that are not contained in the roughage. In feeding concentrates the dairyman should bear the following facts in mind:—

1. Concentrates are fed according to production, whereas roughage is fed according to the size of the cow. If a cow receives plenty of good roughage she should as a rule receive 1 lb. of grain for every 3 to 4 lbs. of milk produced daily. To feed the correct amount of concentrates, therefore, it is necessary that the farmer should have a fairly good idea as to the milk production of each cow. There is only one way of determining the milk yield of a cow, and that is by means of a scale, and the milk produced by each cow should

be weighed occasionally, if not daily, in order that the grain ration may be adjusted.

2. The amount and quantity of concentrates to feed depends very largely on the nature of the roughage available. Roughages of low protein content such as veld hay, maize silage, etc., must be supplemented by liberal quantities of protein rich feeds. Roughage containing a legume hay, on the other hand, may be supplemented by smaller amounts of less expensive feeds.

3. In feeding concentrates the farmer should endeavour to make use of several feeds. The grain mixture should consist of feeds derived from at least two, and preferably three or four, different sources; ground beans, maize meal and ground monkey nuts make quite a good grain mixture. Maize meal, wheat bran and monkey nut cake make an excellent concentrate mixture. The grain ration should have as much variety as possible.

4. Attention should be paid to the fact that a concentrate mixture should not consist entirely of heavy feeds, and in mixing grains an attempt should be made to include at least one light feed in the mixture.

An ideal concentrate mixture should weight about 1 lb. per quart. Wheat bran is a light food and gives bulk to a ration. Corn and cob meal is also a light, bulky feed. If maize and cob meal is not available, use should be made of feeds such as beans, where the pods can be ground along with the seed to furnish a certain amount of bulk and to lighten the ration.

5. The suitability of the feeds used should also be considered. Cotton seed cake is costive and should not be fed to cows shortly before calving. Bean meal is apt to cause purging if fed too liberally.

Compounding Rations.—In compounding rations for his dairy stock the farmer should bear in mind the fact that it is not necessary nor practicable under average Rhodesian conditions to calculate rations separately for each cow in the herd. The average Rhodesian farmer is attempting to dairy with cattle quite unsuited for the purpose, and in order to obtain a reasonable milk or cream cheque many farmers in this country are compelled to milk as many as one hundred

or more cows. Where cattle of this kind are concerned it is difficult to suggest any system of feeding that would be economical as well as practicable. As far as possible cows of poor milk-producing capacity should subsist chiefly on grazing in spring and early summer, and be supplied with an abundance of silage and legume hay in autumn and winter. There are many farmers, however, who have dairy herds capable of average and more than average production, and it is with these that the following is concerned.

Assuming that the farmer desires to compound a standard ration for his herd, which consists possibly of quite good milk-producing cows of about 800 lbs. live weight, and yielding two gallons of milk daily, the milk testing 3.5 per cent. butter fat, he should proceed as follows:—

On referring to a previous page it will be seen that the daily requirements for a cow of this kind are the following:

800-lb. COW PRODUCING 20 lbs. OF 3.5% MILK DAILY.

	Dry matter. lbs.	Digestible protein lbs.	Total digestible nutrients. lbs.	Nutritive ratio.
For maintenance	16	.56	6.34	
For 20 lbs. 3.5% milk	5	1.10	6.32	
Total	21	1.66	12.66	1: 6.6

If we assume that the only feeds available are veld hay, maize silage and maize meal, the following rations are suggested. The amount of protein, etc., supplied by the feeds is given in each case. The first ration consists of veld hay and silage fed in quantities that the animal could be reasonably expected to consume, i.e., 10 lbs. of veld hay and 30 lbs. of maize silage. To calculate the amount of dry matter, protein, etc., supplied by such quantities of these feeds, reference should be made to the "Analysis of Feeds" at the end of this article. Veld hay, for instance, contains in 100 lbs.—

Dry matter	91.9 lbs.
Digestible protein	1.2 lbs.
Digestible nutrients	35.9 lbs.

10 lbs. of veld hay would therefore contain—

Dry matter ... ... $\frac{91.9}{10}$ = 9.19 lbs.

Digestible protein ... ... $\frac{1.2}{10}$ = .12 lb.

Digestible nutrients ... ... $\frac{35.9}{10}$ = 3.59 lbs.

In a similar manner the amount of the various nutrients contained in 30 lbs. of silage can be calculated.

	Dry matter. lbs.	Digestible protein. lb.	Digestible nutrients. lbs.	Nutritive ratio.
Ration No. 1.—				
10 lbs. veld hay ...	9.19	.12	3.59	
30 lbs. maize silage	7.26	.33	4.50	
	16.45	.45	8.09	1: 17
Ration No. 2.—				
10 lbs. veld hay ...	9.19	.12	3.59	
30 lbs. maize silage	7.26	.33	4.50	
4 lbs. maize meal ...	3.66	.29	3.47	
	20.11	.74	11.56	1: 14.8

If the amount of protein, etc., contained in these two rations be compared with the amounts of the various nutrients required by the animal in question, it is only too evident that both of these rations are unsuitable and very inadequate for a cow producing two gallons of milk daily.

For the sake of clearness the nutrients contained in these two rations are compared with the requirements of the animal in the following table:—

	Dry matter. lbs.	Digestible protein. lbs.	Digestible nutrients. lbs.	Nutritive ratio.
Requirements of 800-lb. cow producing 20 lbs. 3.5% milk	21	1.66	12.66	1: 6.5
Ration No. 1 ...	16.45	.45	8.09	1: 17
Ration No. 2 ...	20.11	.74	11.56	1: 14.8

Ration No. 1 does not supply sufficient protein for maintenance of the animal, apart from the amount of this nutrient required to produce two gallons of milk. This ration is also deficient in dry matter and digestible nutrients, and is badly balanced, having a nutritive ratio of 1 to 17 instead of 1 to 6 or 1 to 7.

Ration No. 2, on the other hand, supplies sufficient protein for maintenance and leaves a small surplus of .18 lb., which can be used for milk production. This quantity of protein in this case is sufficient to produce 3 lbs. of milk—roughly, about 2½ pints of milk.

Nos. 1 and 2 are very common winter rations in this country; in fact, many dairymen would regard 4 lbs. of maize meal plus silage and veld hay as a very liberal ration. The inadequacy of the ration, however, is apparent from the above. A cow of this kind fed for any length of time on this ration could not possibly continue to give two gallons of milk, and eventually her production would drop to the quantity in proportion to the amount of protein available for milk-producing purposes.

It is true, of course, that some cows, in which the natural impulse to produce milk is very strong, would continue to yield two gallons of milk on this ration for some time; but such production would be at the expense of the animal's own tissues, and the cow would rapidly lose flesh, and in time the milk flow would cease.

Another unsuitable ration, and one frequently fed, is the following;—

	Dry matter. lbs.	Digestible protein. lb.	Digestible nutrients. lbs.	Nutritive ratio.
20 lbs. pumpkins ...	1.80	.18	1.48	
10 lbs. veld hay ...	9.19	.12	3.59	
1 lb. monkey nuts ...	.94	.21	1.06	
1 lb. cotton seed	.90	.145	.89	
2 lbs. maize meal ...	1.83	.146	1.73	
	14.66	.801	8.75	1: 9.9

This ration is deficient in protein, digestible nutrients and dry matter. It is badly balanced, having a nutritive ratio of about 1 to 10, and the concentrates carry more fat

than can be readily digested by the average dairy cow. Monkey nuts and cotton seed contain a very high percentage of oil or fat.

Having discussed a few typically unsuitable rations, it now remains to discuss a few good rations and to demonstrate the economy of feeding good roughage.

The economy of feeding good roughage such as legume hay is clearly shown by the following, where two rations are compared. In one ration the dry roughage consists of veld hay, and in the other a legume hay is used:—

Ration "A."—

30 lbs. maize silage.
10 lbs. veld hay.
3 lbs. maize meal.
2 lbs. monkey nut cake.
1 lb. dolichos beans (seed and pod).

This ration contains:—

Dry matter	21.82 lbs.
Digestible protein	1.72 lbs.
Digestible nutrients ...	13.11 lbs.
Nutritive ratio	1 to 6.6

Ration "B."—

30 lbs. maize silage.
15 lbs. cowpea hay.

This ration contains:—

Dry matter	20.70 lbs.
Digestible protein	1.68 lbs.
Digestible nutrients ...	12.30 lbs.
Nutritive ratio	1 to 6.3

These two rations, which are more or less suitable for an 800-lb. cow producing two gallons of milk, show a striking difference in cost. The concentrates in Ration "A" would probably cost about 5d., whereas Ration "B" contains no grain at all, and yet supplies practically the same amount of protein, etc. Obviously, therefore, Ration "B" is the more economical of the two. It is not suggested, however, that where leguminous roughage is available no concentrates of any kind should be fed. It will be noted

that the roughage given in Ration "B" is rather more than a cow of this kind might possibly consume; 30 lbs. of silage is not an excessive allowance for an 800-lb. cow, but 15 lbs. of hay is a heavy allowance of dry roughage, and if the hay is at all unpalatable it is quite probable that a cow of this size might refuse to consume this quantity of dry feed. It is just as necessary to supplement leguminous roughage as it is to supplement hays such as veld hay, maize stover, etc., for the simple reason that no cow of more than average production can consume sufficient roughage of any kind to meet her requirements for milk production. It is generally conceded, however, that cows of less than average performance can be fed chiefly on roughages, but that a good cow should receive portion of her ration in a concentrated form; and the economy of feeding legumes lies in the fact that where an abundance of leguminous roughage is available for feeding, the concentrates required to balance the ration can consist very largely of cheaper grains, and need not be fed in such liberal quantities as would be required in a ration where a poorer quality of roughage was used.

(To be concluded.)

Harvesting, Packing and Marketing of Deciduous and Tropical Fruits.

By G. W. Marshall, Horticulturist.

This article on the harvesting, packing and marketing of Rhodesian fruits has been prepared to encourage the adoption of methods likely to be most remunerative to the small or large fruit grower. Not only are medium and good quality fruits to be found growing in various districts of this Colony, but fruit equal to the best produced in the Union of South Africa is to be found in several districts, especially in areas at an altitude of 5,000 feet and over. This naturally applies to deciduous fruits only, but tropical and sub-tropical fruits do equally well in Southern Rhodesia, though only at the lower elevations.

During some of his recent tours, the writer has been so impressed with the necessity for the better marketing of most of the fruits grown that this opportunity is taken to criticise existing methods and at the same time attempt to offer suggestions for the future welfare of the industry.

In the past fruit growers have planted a great number of different varieties of fruits; a few have done well, but many have failed. These successes and failures have supplied valuable data from which suitable lists are compiled on behalf of prospective fruit growers, and it should now be possible to plant small or large commercial plantings with every prospect of a high percentage of the trees being productive and profitable.

There should be no necessity to repeat many of the mistakes made by the pioneer planters. In the early days no local data were available and growers had to be guided in their plantings by nurserymen who did not know the con-

ditions under which their trees were expected to grow. We have the pioneer planters to thank for our available data, and prospective growers have themselves to blame if they plant trees indiscriminately without enquiring if the varieties are likely to do well in their particular locality.

The above few paragraphs do not deal directly with the harvesting and packing of fruit, but indirectly they play a very important part in that production has and is being restricted. There is no necessity to continue importing large quantities of Union-grown fruit. There is a large quantity of Rhodesian fruit available, but it must be properly harvested and packed. A great deal of this fruit is of excellent quality, and it is also in great variety.

Several of our fruit growers are now marketing their gruit in a business-like manner, and these growers have realised that it pays handsomely; others have made no attempt to market their fruit, and merely allow it to go to waste or give it away, while a few market some of their fruit in bulk.

The fruit marketed in bulk is frequently picked over-ripe, sometimes it is too green, or it is wormy. Very often a high percentage has to be thrown away by the retailer owing to one or more of the above causes. Many consumers complain about the price charged for the fruit by the retailer, but the latter is not always to blame. Had the grower harvested his fruit at the correct stage of ripeness and handled it carefully, he would have received more for his fruit and the consumer would possibly have paid less. Why? Because the retailer is able to sell all of the fruit received at a reasonable profit.

Some of the home orchardists, after providing for their own requirements, find themselves with a small surplus. This surplus could in most instances be disposed of to the advantage of the grower. Medium sized and good quality fruit if well packed will invariably realise a better price than the larger sized and better quality fruit which has been carelessly harvested and marketed in bulk.

The writer need only cite one personal experience in this respect. In 1908 it was difficult to secure adequate supplies of packing material. Owing to the large crop of

fruit harvested that season the writer ran out of packing material. One consignment of fruit had to be railed comprising about one-half packed correctly in the small 12 inch by 18 inch trays which held about 20 fruits each, while the remaining half of the consignment had to be packed in the old-fashioned manner, namely, in paraffin, candle, soap and other boxes, all of which were clean and well washed. These boxes averaged over 100 fruits each. On receipt of the account sales, the writer was astounded to find that the small containers had realised an average price of 3s. 6d., whereas the large or bulk packed boxes only averaged 5s. 6d. The monetary loss on this half and a few subsequent consignments was considerable. The packing material to pack 1,000 fruits then cost approximately 35s., which represented 50 trays, wood wool and tissue paper wrappers. The 50 trays containing 1,000 fruits realised 3s. 6d. each = £8 15s., and after deducting the cost of the packing material, £7 was left. The remaining 1,000 fruits, packed in 10 boxes, realised £2 15s. The boxes at that time cost 6d. each, and after deducting 5s., this left a balance of £2 10s. From the above figures it will be noticed that a loss of about £4 10s. was the net result on the half consignment. The following few consignments, averaging 20 bulk boxes per day, resulted in a daily loss of about £9. Immediately the fresh supply of packing material arrived and the fruit was correctly marketed the prices at once returned to the 3s. 6d. level, or £17 10s. from 100 trays containing 2,000 fruits. From the foregoing figures it will have been noticed that fruit properly packed was a paying proposition, whereas bulk packing was very unremunerative by comparison. After deducting the costs of production, labour for packing, cartage, railage and marketing charges, there was very little left for the producer where bulk packing was the method adopted. This experience proved to be a valuable lesson, and the following seasons saw adequate supplies of packing materials procured well in advance. The chief reason for the great difference in the prices received was undoubtedly the size of the container used for bulk packing being too large for the consumer, and these boxes found their way to the retailer or middleman. The smaller pack is easy to handle, and the contents are not too much for the average family man.

Prior to the adoption of the modern system of packing, the old and ungainly container was in general use in the Union of South Africa. With the advent of modern packing the profits went up and the planting of commercial orchards became the order of the day.

Before success may be attained in the marketing of fruit either by the large or small fruit grower, he should take the following factors into account:—

(1) Stage of ripeness at harvesting.

(2) The keeping and carrying properties of the fruit.

(3) The distance from the markets; also the condition of the roads.

(4) Class or variety of fruit in demand by the consumer, and the purpose for which it is required.

(5) Supply and demand.

(6) Method of packing, evenness of size, freeness from pest and disease, etc.

(7) Method of disposal, through agents or private orders.

One of the most important phases in the successful marketing of fruit is undoubtedly the degree of ripeness at harvesting. The writer has noticed that most Rhodesian fruit is harvested when it is too ripe. This in some cases is the correct stage to harvest fruit for home consumption, but not for marketing. Fruit permitted to ripen on the tree is in nearly all instances too ripe to market, and over-ripe fruit often lacks flavour. It is sometimes mealy or granular, and in almost every case it will not keep for any length of time. Tree ripe fruit is also more susceptible to the attacks of pests in one form or another, and the consumer in many instances is unable to find sound fruit in his purchase. Had the grower harvested his fruit earlier there would have been less loss from windfalls, little or no injury when handling the fruit, and much of the fruit would not have been damaged by fruit piercing moths, birds or fructivorous bats, etc. In addition, he would have satisfied customers and assured an ever-increasing demand.

In comparing the edible quality of a fruit that has been harvested at the correct stage of ripeness with one that has become tree ripe, there is an excellent example in the Williams Bon Chretien pear. When this fruit is correctly harvested and store ripened, it can be described as white fleshed, fine grained, buttery, melting, delicious flavour and powerful musky aroma. A tree ripe fruit would be classified as mealy and unpalatable.

The following table indicates the condition in which fruits should be harvested.

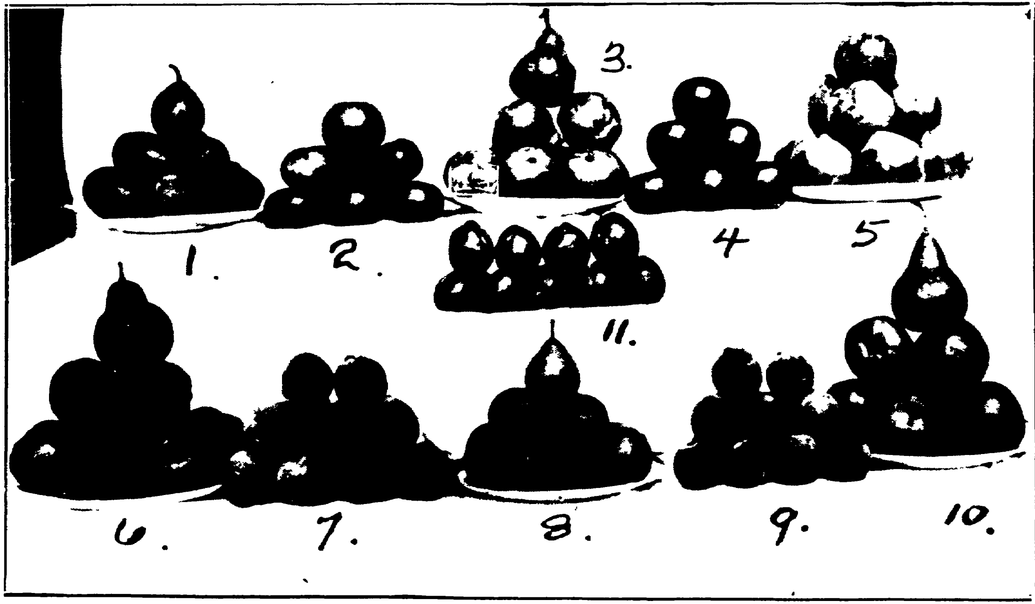


Illustration No. 1.—Staged fruits (see text).

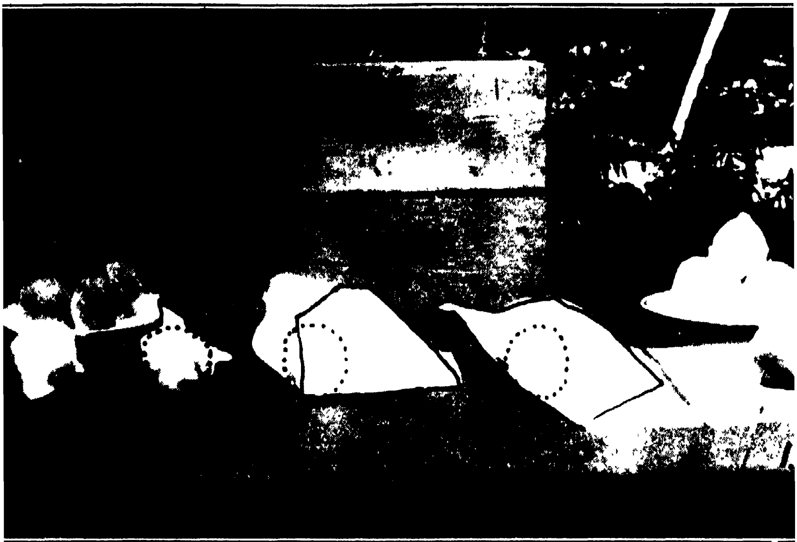


Illustration No. 2.—Fruit wrapping (see text).

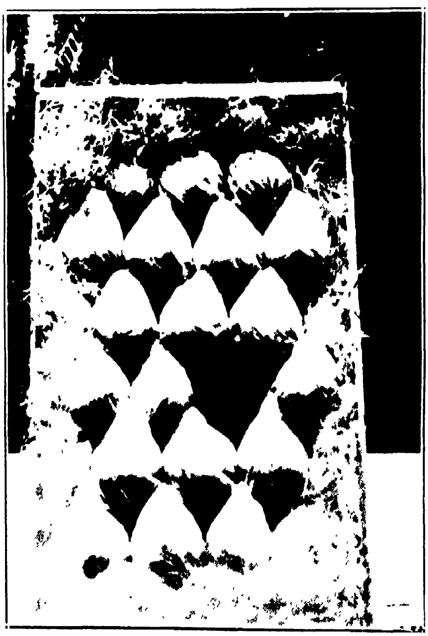


Illustration No. 3.—Tray of wrapped fruit (see text).

Variety	For culinary purposes	For marketing	For home consumption	How ripened
Apples ...	Fully developed but still green	Fully developed, good colour and the fruit stem detaches easily from the tree	The same as for marketing. A few early varieties may become tree ripe	Store on shelves or in ventilated boxes in a cool, dark store or dry cellar. Single layers are safest
Pears ...	Do.	Do. Some varieties do not colour	Do.	Do.
Quinces ...	When turning yellow and fully developed	Fully developed and turning yellow. Seeds brown and encased in jelly	Same as for marketing to tree ripe	Seldom stored, but may be treated as recommended for apples
Apricots ...	Fully developed and turning yellow	Good size and colour, but firm	From marketing stage to tree ripe	Seldom stored
Peaches and Nectarines ...	Commencing to colour	Good size and colour, but firm and softening round stone	Tree ripe if possible	Not stored
Plums ...	Good size and colour	Fully developed and mostly good colour; firm. Some varieties, such as Wickson, may be harvested when yellow	Many varieties tree ripe. Wickson type when yellow but reddish tip, then ripen in store	Some varieties to be stored until they colour or soften
Figs ...	Green to tree ripe for green fig preserve or jam	Good colour and size, but firm, with a tendency to soften	Tree ripe	Never stored

Variety	For culinary purposes	For marketing	For home consumption	How ripened
Grapes ...	Ripe for jam	Ripe with high sugar content	Ripe	Some varieties may be hung on lines or placed on shelves, such as Almaria
Bananas ...	...	Fully developed, but green and dried. Calyx has fallen or easily detaches when touched	Same as for marketing	Hang bunches in store room until fruit softens
Plantains ...	...	Fruit turning yellow on bunches	Do.	Do.
Custard apples ("Annona") ...	...	Fully developed. Seeds black, but fruit firm	Fruit softening	Store until fairly soft to feel
Guavas ...	Good size, colour and firm	Good size, colour and firm	Same as for marketing to softening	Store if necessary
Feijoa or pineapple guavas	Ripe and soft	When ready to fall or fairly soft	Collect after they fall to the ground	Not stored
Grenadillas ..	...	When purple to when they fall to the ground	Purple and outer covering shrinking or allow to fall to the ground	Not necessary
Loquats ...	...	Good size and colour, not too acid, but still firm	Tree ripe or sweet and softening	...
Mangoes ...	Green for chutneys	Good size and colour if green variety, before they soften	When they commence to soften	...

Variety	For culinary purposes	For marketing	For home consumption	How ripened
Pawpaws ...	Good size and green. Latex not too watery	Good size and commencing to show signs of yellowing	Same as for marketing to ripe	Store until soft when necessary
Avocado ...	...	When they change from a bright to a yellowish green, but still firm	Same as for marketing	Store until the fruit softens
Pineapples ...	...	Changing colour to well coloured but firm	Good colour or fully ripe	...
Tree tomatoes ...	...	Good colour and just before they soften	As they soften	...
Pomegranates ...	...	Grains good colour and sweet	Same as for marketing	May be kept several weeks on shelves
Litchi ...	...	To be picked in clusters (not singly) when the insides have good flavour and size, but firm. The outer covering is usually brown at this stage	From marketing stage to ripe	Do not store too well. Refrigerated chambers best
Persimmon ...	...	When fully grown and before it softens	When it commences to soften	Store until ripe

As a general rule fruit that is harvested prematurely will shrink and wither, and it will in many cases be unpalatable.

When harvesting pomaceous fruits, such as pears, apples, etc., it is extremely important that the fruit be neither too green nor too ripe, but there are a few exceptions to this rule. An excellent test, although not always dependable, to ascertain the correct stage for harvesting the pear in particular is one in which the fully developed fruit is gently lifted upward. If the fruit stalk detaches from the twig or shoot easily, the fruit is ready to harvest. A safer test for the amateur is one where the fruit should be cut through the centre horizontally to expose the seed cavities, and if the seed is commencing to turn brown the fruit is fit to harvest. Some apple and pear varieties may be found to have brown seeds before the fruit is fit to harvest; a little experience will soon rectify matters.

When marketing fresh fruit, the keeping and carrying properties of the fruit grown must be taken into consideration. In addition, one has to consider the state of the road over which the fruit is to travel and the distance from markets.

No grower should attempt to pack and market any of his fruit that will not keep sufficiently long to enable the buyer to consume it before waste occurs. There are many fruits that have excellent keeping properties. These should always be planted for marketing purposes in preference to other varieties. One sometimes has to market fruits with poor keeping qualities, but even these may often be marketed to advantage. This type of fruit should always be packed in small containers, and harvesting and packing should be so arranged that the packed fruit is railed or sent to its destination without delay.

The writer has known a careful packer harvest and market his fig crop up to two hundred miles distant from his farm. The system adopted comprised harvesting the fruit from 5 a.m. to 8 a.m., packing from 9 a.m. to 12 noon. The fruit was then carted to a railway station four miles distant, and from thence forwarded to the various markets. The fruit was sold at excellent prices. Success was attained owing to this grower harvesting and packing the fruit carefully.

The consumer must be considered when fruit is to be marketed; therefore supply the class of fruit demanded either for dessert or culinary purposes. If for dessert, the fruit should be supplied in small containers. Fruit for culinary purposes is often sold in larger quantities and at a cheaper rate; therefore larger and cheaper receptacles may be used to pack this class of fruit in.

All fruit sales are regulated by the demand. If a large crop of fruit has to be marketed it would be unwise to send large consignments to the same market at intervals of, say, three to seven days. The distribution should be so arranged that the fruit is sent in proportion to the population of the area served by the market. It should also be sent daily where possible, or at frequent intervals.

Fruit growers who regulate their supplies properly usually receive remunerative returns. A case occurred on a market in the Union several years ago, where a fruit grower sent eight trays of fruit tri-weekly to a small market. He received an excellent price for all of the fruit, but when he increased the consignments to twenty trays for each market, prices slumped, and the net returns received were insufficient to pay for the packing materials used. When eight trays were sent to this particular market, there were from ten to twelve buyers for this class of fruit. When the increased supplies were marketed, there was no proportional increase in the number of buyers, hence the slump.

When large quantities of fruit have to be marketed, it would be advisable for the grower to conform with all of the regulations of the Union of South Africa governing the export of fruit. He will then be in a position to market fruit in South Africa and possibly overseas. Printed copies of these regulations for either deciduous or citrus fruits are procurable from the Fruit Exchanges or Fruit Inspectors.

As the Rhodesian fruit industry is still in its infancy, the writer will confine himself to the most important factors that lead to success.

(a) Careful handling in all operations.

(b) The evenness of size of the fruits in each tray or box.

(c) Freeness from bruise, blemish or malformation.

(d) Attractiveness of the pack.

The size of the fruit tray to use is one measuring 12 inches by 18 inches outside measurements, and the depth will vary in accordance with the size of the fruits to be packed. This size container is in general use. It is easy to handle by the purchaser, it holds a reasonably small quantity of fruit and is less liable to damage. The contents are also sufficient for the average family man.

Fruits with a diameter of 2 inches should be packed in a tray 2½ inches deep. This depth allows a ¼ inch below and above each fruit for packing materials. A 3 inch fruit would require a tray 3½ to 4 inches in depth. Small plums could be packed in two or more layers when necessary. With the better and larger fruits single layers are advised. All packing materials should be purchased well in advance of the fruit season, and a sufficient supply procured for the whole crop. Fruit merchants are always prepared to quote for large or small quantities of packing material, f.o.r. or delivered to the nearest station. The packing materials necessary comprise trays or boxes 12 inches by 18 inches, depth optional, for small containers. If the standard apple box is to be used, the inside measurements should be 18 inches by 11½ inches by 10½ inches deep. Wood wool should be of a good pliable quality, and good quality tissue wrapping paper in the different sizes ranging from 8 inches by 8 inches to 12 inches by 12 inches, according to the size of fruit to be wrapped.

When the fruit is nearing the stage for harvesting it is advisable to have the trays or boxes made up in advance. These should also be lined out with a small amount of well teased wood wool. A small packer with limited labour and sufficient storage space could make up most, if not all, of his boxes before harvesting.

Picking bags and field boxes are only advised where the grower has large crops to handle. If the fruit is in any way tender, a few small trays could be used for placing the fruit in as gathered.

If everything is in order and the fruit is ready to harvest, the wood-wool lined field trays should be carted to the orchard and carefully stacked under shady trees.

Harvesting must be conducted with care. Select the best fruit which is of the correct size and stage of ripeness,

and lift or twist it gently (never pull it) until it detaches from the tree. Then place the fruit (with care) in the trays, and as the trays are filled they should be sent to the packing room or shed where they should be carefully stacked after dusting, one above the other, care being exercised that the upper trays do not touch and thus damage the fruit in the trays beneath.

When harvesting fruit the picker must always aim at the retention of the fruit stem or stalk. Fruit from which the stalk has become detached will decay or wilt more readily, and the keeping properties are considerably impaired. Fruit that does not detach easily must be clipped in the same manner as is done when harvesting citrus fruits.

Harvesting should continue from time to time as the fruit sizes up and is at the correct stage of ripeness. It may sometimes be necessary to pick over a tree several times before the tree has been completely harvested. Harvesting should take place when possible during the cool portion of the day and cease when sufficient fruit has been picked for that day's packing; this, of course, only applies to the smaller grower. The fruit is then carefully sized. An experienced packer is able to do this by feel and appearance. Large packers often use special machines for the sizing of their fruit. With the amateur packer it would be advisable to have a sizing board as is used by most deciduous fruit packers in the Union of South Africa. The sizing boards could be made of $\frac{1}{2}$ inch soft wood, such as clear pine or poplar, and the holes carefully cut with an expansive bit. The size of these holes should be $1\frac{1}{4}$ inches rising in eighths of an inch to $2\frac{1}{2}$ inches for plums, $1\frac{5}{8}$ inches to $2\frac{1}{8}$ inches for apricots, $1\frac{3}{4}$ inches to $2\frac{3}{4}$ inches for peaches and nectarines, $1\frac{3}{4}$ inches to $3\frac{1}{2}$ inches for pears and $2\frac{1}{4}$ inches to 3 inches for apples. For peaches, pears and apples the size should rise by $\frac{1}{4}$ inch each instead of $\frac{1}{8}$ inch previously stated. All the holes should have their edges rounded with glass paper to prevent damage taking place when sizing fruit.

During the actual operation of sizing, the sizer should have a petrol or similar box from which the lid and one side have been taken off. This box should be placed immediately in front of him. The sizing board is then placed on the open top and there is now an open front to the box. If correctly arranged, a stack of trays containing the freshly

gathered fruit will be at one side of the sizer and several empty trays on the opposite side. The sizer should then take a fruit from the full trays at his side and place it over, say, the 2 inch hole. If it does not pass through this hole to his disengaged hand which is held immediately under the hole, he tries the next larger hole, and should it pass through this hole to his disengaged hand it is a 2 inch fruit. The grader then places the sized fruit into one of the empty trays at his side. This process is repeated and the various sized fruits are placed in their respective trays. As these trays are filled, they are handed on for wrapping in tissue paper prior to being packed.

The fruit wrapping process is rather difficult to explain. Elongated fruits, such as the pear, some plums and peaches, etc., are wrapped as illustrated in fig. 2. Round fruits are easier to wrap than elongated ones. With this shaped fruit the packer selects a fruit with one hand; the fruit is then placed over the centre of the sheet of tissue paper held in the other hand and pressed in; the paper hand is then half opened and slipped to the top of the fruit; the fruit then becomes practically enclosed in paper. The fruit hand is next withdrawn to gather all the tissue paper ends and grip them well up against the stem end of the fruit. The paper hand must then be moved back to its original position, where it grips the half wrapped fruit firmly. The two hands should then give a few rapid twists in opposite direction. The wrapped fruit is now half rolled into one hand to press the twisted ends of the paper close to the fruit. The completely wrapped fruit is then placed in the wood-wool lined tray or unlined apple box, as the case may be. In the single layered tray the twist is placed on the under-side; with larger containers the first two layers have the twist up and the remaining layers with the twist down; this gives a neat finished appearance to the completely packed box or tray of fruit.

No hard and fast rule can be laid down as to the actual number of fruits to be placed in each tray. With the larger apple and citrus boxes the numbers for each size are stipulated. Fig. 3 illustrates the 4-3 diagonal pack. This tray could have been packed 4-4, with a total of 20 fruits, in comparison with the 21, where the 4-3 pack is used. Each packer will have to use his own discretion when filling trays.

He may adopt either the straight pack, 4-4, 5-5, or the diagonal pack, 4-3, 5-4, etc. The object in every case is to finish off the last row with only a small space available for the wood-wool lining. A straight 4-4 pack may give an inch or more space at the end; this is too much; a 4-3 pack would possibly have only ½ inch space, and if so, the diagonal pack should be adopted for that particular size or class of fruit.

When packing fruit the tray should be immediately in front of the packer lengthways, with the furthest end raised a few inches. This tilting of the tray prevents the fruit from being displaced when once placed in position. A thin yet sufficient layer of wood wool is used to line the bottom, ends and sides of the tray. If too little or too much wood wool is used, the fruit will either be bruised or the settling of an over-liberal supply will cause bruises when the fruit commences to shake while in transit.

The first row of wrapped fruit should be placed with the twist underneath, and the calyx or flat end toward the packer. All subsequent rows may then be reversed so that the calyx or flat end of the last row will face the opposite end of the tray. The diagonal pack should be used where possible, for less damage is likely to occur owing to the stem of one fruit coming in direct contact with the fruit in the row next to it, as is the case with square packed fruit. Diagonally packed fruits have the stems resting between fruits of the next row, and there is little or no likelihood of damage taking place.

In fig. 3 it will be noticed that the flat or stem end of the fruit is toward the end of the tray and the remaining rows are reversed. If apples and tomatoes are to be packed in single layered trays, it is often advisable to pack them flat with the stem on the under-side; the best coloured portion is then uppermost.

As previously stated, a packer should not be too liberal in the use of wood wool. The tray should be filled with fruit, and only a sufficient supply of wood wool used to prevent bruising of the fruits. With very tender or over-ripe fruit it is sometimes advisable to use a very small amount of this packing material between each fruit. When too much wood wool is used,

there is a danger of the fruit becoming loose. When the packing material settles down this loose fruit will shake and the contents will be damaged while in transit. Fruit very tightly packed is also an objection, as each fruit is apt to damage the fruit next to it. It is easy to distinguish a tray that has been packed too tightly, for the fruit will bulge in the centre of the tray. Again, fruit that is too loosely packed will have a tendency to roll out of the tray when the latter is tilted to any extent. When the trays are filled with wrapped fruit a thin and sufficient layer of well teased wood wool must be placed over the top of the fruit, and the straggly ends must be carefully twisted and pressed in between the outer rows of the fruit and the sides and ends of the tray. This operation must be gently performed to prevent damage occurring.

The lid is nailed on with a wooden cleat at each end, and the nails must be driven in through the cleat and lid, and not through the lid first and then again through the cleat; four plain 1½ inch wire nails at each end will be sufficient. When nailed in this manner the trays are easily opened without damaging the lids, and retailers are also able to display the fruit to advantage.

To test a well packed tray of fruit after it has been closed, lift the tray, holding it firmly with one hand at each end, and then shake vigorously as one would when sifting sand. If the fruit remains firm and no rattling or movement is audible, the tray has been well packed. When the contents shake or rattle, it has been too loosely packed or too much wood wool used, and the fault must be rectified.

The cleats previously referred to are small wooden battens, usually ¾ inch by ½ inch and 10½ inches to 11 inches in length. These strips of wood do not only facilitate the opening of the trays, but permit of air spaces between the stacked packed fruit. Well packed fruits also have a very slight bulge, so that the cleat prevents direct pressure on the lower trays when stacked. Exporters use various coloured cleats to distinguish between the different packed fruits.

A good packer must always act honestly. When the consumer demands his product, there is always the possibility of the demand outgrowing the supply when good fruit is well marketed. When this occurs there is a likelihood of inferior

fruit being incorporated in the packs. Do not attempt to meet the increased demand by packing such fruit and thus ruining the brand.

It is very desirable to make the fruit containers as attractive as possible. Neatly printed ends or labels are advised. Have a simple but distinctive yet artistic design. and one easy to remember by the consumer. The cost is negligible when compared with the increased price received for the fruit.

The grades for deciduous fruits are in most cases regulated by the sizes, as for example, Williams Bon Chretien pears are graded as follows:—Extra selected 2¾ inches diameter, selected 2½ inches, choice 2¼ inches, graded below 2¼ inches, with a minimum of 2 inches diameter. Apples and citrus fruits are sold according to counts as well as grades, *e.g.*, extra selected, selected and choice for apples; the sizes vary from 3 inches to 2¼ inches diameter, and the counts 96 to 225 per box: 96 3 inch apples will fill a standard apple box; 225 2¼ inch apples will fill the same size box. If the fruits are of good quality and free from pests or blemishes, they are classed as extra selected. Very slightly blemished fruits would be classed as selected, etc. Citrus fruits are graded according to count and quality; the sizes range from 3⅜ inches down to 2⅜ inches diameter, and the counts are 96 to 288 per standard export box measuring 26 inches by 12 inches by 12 inches outside measurements. The grades are fancy, choice and standard; 96 3⅜ inches diameter oranges will fill an export case, and 288 2⅜ inches diameter oranges will fill the same size case.

Any fruit grower contemplating the packing of his fruit in accordance with the standards laid down in the Union of South Africa fruit export regulations would be well advised to secure a copy of these regulations.

There is no necessity to dwell further on these grades and sizes. As stated, the Rhodesian industry is still in its infancy, and the writer's object at present is to induce fruit growers to market their fruit properly. The consumer requires a neat package containing an even sized and well packed article. If their fruit is to create a demand, growers must discontinue existing haphazard methods such as packing all sizes and conditions of fruit in any form of container. Well packed and good quality fruit is being imported into

the Colony in ever increasing quantities. This importation of fruit should cease and local growers supply the demand.

Avocadas, mangoes, custard apples or cherimoyas, persimmons and guavas may be packed in the same manner as recommended for deciduous fruits. That is in 12 inch by 18 inch trays. All of these fruits should be wrapped in tissue paper and packed with wood wool.

Grenadillas, if well sized, may be packed without paper or wood wool in 12 inch by 18 inch trays, two or more layers deep.

Loquats, litchis and tree tomatoes must be well graded and packed in the 12 inch by 18 inch trays. First lay a small amount of well teased wood wool on the bottom of the tray before packing the fruit in the box, then place a finishing layer of wood wool in position before closing the tray. Wrapping may be used for choice fruits or a sheet of tissue paper placed under and over the fruit.

With bananas and plantains, the hands must be cut carefully from the bunches and packed in boxes or crates; dry banana leaves may be used to pack the hands in.

Pineapples for distant markets may be harvested when the fruit is about 50 per cent. coloured. They should be evenly sized and packed in petrol or similar sized containers. A small amount of fine dry grass or wood wool should be used to line the boxes with. Retain the crowns and about ½ inch to 1 inch of the stem when harvesting.

Paw paws must be packed when fully developed and the fruits are changing from a dark to pale yellowish green and the tip of the fruit shows signs of yellowing. Size evenly, wrap in paper and pack with soft dry grass or wood wool into boxes holding four to six fruits.

Citrus fruits should be wrapped in tissue paper and evenly sized. Pack in standard 26 inch by 12 inch by 12 inch citrus cases.

The distribution and disposal of the fruit should be carefully arranged. If it is marketed through an agent, be careful that it is sent to a reliable and trustworthy man. It can also be sent direct to reliable retail firms, who should be in a position to display the fruit to advantage; or a grower could arrange to dispose of his fruit direct to the consumer. A few small advertisements would start the machinery, and satisfied customers will keep it in motion.

EXPLANATION OF ILLUSTRATIONS.

No. 1.—Staged Fruits.

Description.

Choice Rhodesian fruits grown by Mr. J. H. K. Doyle, Dunedin, Makoni district.

1. Le Conte pear.
2. Ohenimuri apple.
3. Williams Bon Chretien pear.
4. Christmas apple.
5. Cape Selected quince.
6. Glou Morceau pear.
7. Early Crawford peach.
8. Fertility pear.
9. Florida Crawford peach.
10. Beurre Bosc pear.
11. Kelsey plum.

All of Mr. Doyle's fruits are of excellent quality and size (compare the sizes with the match box on Illustration No. 3, Williams Bon Chretien pears). If selected for show, several varieties would have compared favourably with the best Western Province show fruit.

No. 2.—Fruit Wrapping.

Explanation.

(1) Fruit in position on tissue paper for wrapping.

(2) First fold completed.

(3) Second fold completed and fruit ready to roll half-way round.

(4) After rolling, and with all the loose ends of the tissue in position for twisting. The fruit is now lifted in one hand and the loose ends of the tissue are firmly held in the other hand, twisted and the twist placed under the completely wrapped fruit.

(5) Wrapping completed and fruit ready to place in the tray or box.

No. 3.—Tray of Wrapped Fruit.

Tray of Elberta peaches several days after arrival in Salisbury from Capetown. Fruit well sized, packed and sound.

Poultry Parasites.

By A. Little, Poultry Expert.

From a survey of the various disorders of poultry none appears more troublesome than the problem of infestations of poultry parasites. These cause general unthriftiness and unproductiveness among fowls, and although not always producing fatal results, cause the birds to be decidedly unprofitable. They prepare the way for debility and disease, resulting in the death of the birds.

Although poultry parasites are no more common in this Colony than elsewhere, few poultry keepers realise the extent to which they are present. Whenever fowls appear out of condition, the first thing to ascertain is whether their bodies externally or internally are affected with any parasites.

Cleanliness of the fowls, their houses and surroundings should be strictly adhered to. Plenty of sunlight and fresh air should penetrate to all parts of the houses; sunlight is the best germicide we have. Dark, stuffy, ill-ventilated houses are the breeding grounds for poultry parasites, and yet how many of such houses can still be seen. It is no wonder the birds are out of condition and unprofitable. Periodical spraying of the interior of the houses and fittings should be carried out with one of the following mixtures:—

(1) Four tablespoonfuls of kerol, hycol, izal or a similar disinfectant to four gallons of hot water.

(2) A 10 per cent. solution of carbolic acid.

(3) One pound of hard soap cut into thin shavings and dissolved in one gallon of water. Heat gradually till it boils, then add one pint of carbolic acid; stir well till it becomes a creamy mass. Then for use take one pint of this and add ten pints of water, mix well, and spray.

(4) Instead of carbolic acid, paraffin can be used for the above.

(5) Creosote in a 2 per cent. solution.

Fumigating the houses is another method of destroying insects, but is not so beneficial or easy of manipulation as spraying. To eliminate insects on the bodies of the birds, *dipping* is infinitely the best method, although some have recourse to dusting with an insect powder. The best and simplest dip for this purpose is one to two tablespoonfuls of kerol, hycol, izal or similar disinfectant mixed with four gallons of water and used at a temperature which can be comfortably borne by the hand.

The intention in this article is to deal only with those parasites which are most common in Rhodesia. The gape worm, which causes gapes in chickens, is unknown in this Colony, but in countries with a humid atmosphere, and where earth worms (which are the hosts of the gape worm) are plentiful, it is very common and causes great mortality; the same applies to some other poultry parasites.

Internal Parasites.—These are usually found in the intestinal tract.

The Dispharagus spiralis.—This is a round worm about ½ inch in length, found in the œsophagus.

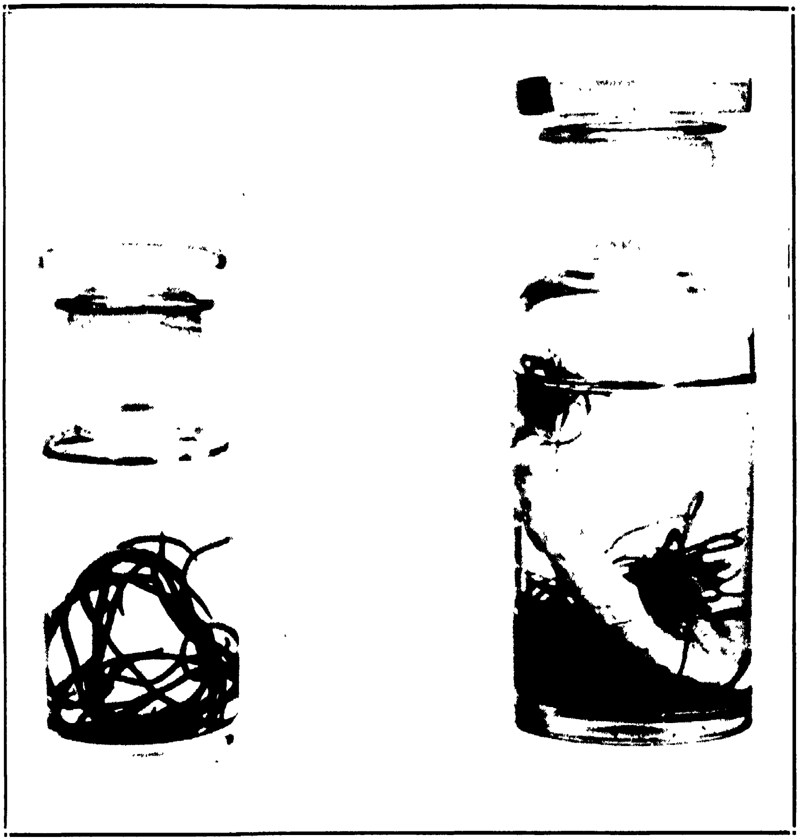
The Dispharagus nasutus.—Also a round worm about ¼ inch long, found in the gizzard. Sometimes hidden in the mucous membrane and sometimes only partly hidden, with one extremity hanging in the cavity of the gizzard.

The Trichosoma contortum is also a round worm from ½ to ¾ inch long, found in the walls of the œsophagus; they are usually found in young ducks. The symptoms consist of arrest of growth, emaciation and weakness, with sometimes epileptiform attacks. In eight to ten days the lower part of the neck swells and death results.

Heterakis perspicillum.—This is the ordinary round worm, which is very common, and found in the small intestine; it varies from 1-25 inch to 3 inches in length. It is round and cylindrical in shape, tapering at both ends, and is found, not attached to the walls of the intestine, but lying free in its cavity in groups and bunches. Reproduction takes place by the development of embryos from eggs passed in the droppings; therefore it is obvious that all droppings should be treated with lime or burnt.

Symptoms of the presence of round worms are a ravenous appetite and great thirst. If the worms are numerous the appetite fails, the bird is unthrifty, it lays infrequently, and is weak and emaciated. Death may be caused by mechanical obstruction of a large mass of worms in the intestine, but this is not often the case; impaired health is usually only the outcome, and this is caused, not only by the presence of these worms in the intestine, but also by the poisons they produce and which are absorbed by the birds.

Tape Worms.—These vary in length and breadth, and are elongated, flat and ribbon-shaped; they vary in length up to 4 to 5 inches. The smaller ones are formed in the duodenum and first portion of the small intestine; the larger ones in the ileum or lower end of the small intestine. Each worm has a head and neck and a number of segments. On the head is a set of hooks and four suckers; by means of these the worm attaches itself to the mucous membrane; the segments usually break away, leaving the head, which then develops more segments. Unless the head is detached, and this cannot be effected unless the worm is killed, no improvement in the condition of the bird can take place. The colour of the worm is creamish-white. The life history of the tape worm is interesting; it is similar to that in man. The worm produces segments which are filled with ripe eggs. These segments pass out in the droppings and the eggs are thus set free. These find their way into damp places, where they are absorbed by insects or flies. The eggs, after reaching the intestinal tract of the insect or fly, are acted upon by the digestive juices; the shells are dissolved and the embryos set free. These burrow into the intestinal wall, and through it into the liver or other organ, and there rest awhile. This insect or fly is eaten by a fowl; the young worm then emerges from the organ and body of the insect in which it has been resting and attaches itself to the wall of the fowl's intestine, and there develops. It will therefore be readily understood from the above how infection takes place, especially if affected birds are numerous and the runs, etc., contaminated with droppings containing ripe eggs. Symptoms are much the same as those seen in round worm infestation. In addition, there is a yellowish-white diarrhœa, and segments may be found in the droppings. The birds become anæmic, the



Heterakis perspicillum. On right: Some of a number of these worms found in the small intestine of a fowl. Note the packing of a portion of the intestine with them. On left: Other worms of the Heterakis variety, viz., Heterakis compressa, found in the intestine of a fowl. These worms vary from 2 inches to $3\frac{3}{4}$ inches in length.

combs, face and wattle almost white or pale pink. The comb also will shrink in size. The feathers are dry and lose their glossy appearance, and may fall. The birds are mopy and their wings droop. Lameness and even partial paralysis may be present. It is as well to mention that the above are also symptoms of tuberculosis, and only a definite diagnosis can be obtained by killing a bird, slitting up the intestine and examining it for tape worm. In tuberculosis in the liver and spleen, and sometimes the intestines, will be seen small, irregular nodules, which are not present in cases of infestation with tape worms.

Prevention.—The main method of prevention is similar to that which should be adopted in the case of all diseases, viz., by selecting birds of marked vigour and stamina as breeders, thus producing a strain of birds of high resistance to disease and other disorders and invasions of parasites. Prevention *must* be adopted to ensure any hope of success in the elimination of parasites. The birds should all be carefully examined, and all those that show suspicious symptoms should be isolated. The droppings of these should either be burned or treated with lime or sulphuric acid. Where infestation with worms is experienced, all the birds should be moved on to fresh ground at least every two years, and the runs dug up and saturated with a strong solution of unslaked lime, to which is added 5 per cent. of kerol, hycol, izal or similar disinfectant. Spray the house and fixtures with a solution of 50 lbs. of lime to about 50 gallons of water. All food and water utensils should be cleaned daily with a solution of some disinfectant and water.

Medicinal Treatment.—The following can be used generally for round and tape worms:—

(1) Two grains of santonine one hour before the first meal; follow three hours later with a dose of 20 grains of Epsom salts in a tablespoonful of water.

(2) One dram of powdered malefern or 30 drops of liquid extract of malefern before food morning and evening.

(3) Five grains of powdered areca nut, followed by Epsom salts.

(4) To prevent or expel worms it is advisable to feed occasionally chopped onions or garlic.

(5) One teaspoonful of pomegranate root bark in the food to every fifty birds is an excellent remedy for tape worms.

Poultry keepers who suspect that their poultry are infested with round or tape worms are invited to send one or two to the Department of Agriculture for examination and *post-mortem.* These should be addressed as follows: "The Poultry Expert, Department of Agriculture, Salisbury. Fowls for examination. Urgent." They should be forwarded by passenger train, carriage paid.

External Parasites: *The Fowl Tick.*—We have in Rhodesia an external poultry parasite which is a most serious pest, viz., the fowl tick (*Argus persicus*), which is frequently erroneously called the tampan. This tick is also met with in India, Australia, New Zealand and parts of America, but is non-existent in temperate and cold climates. As full particulars of it were given in the *Rhodesia Agricultural Journal* for December, 1920, there is no necessity to repeat them here; a bulletin reprint of it can be obtained from the poultry experts.

Lice, Fleas and Mites.—These are found in practically every locality where poultry are kept. When present in considerable numbers they reduce egg production and hinder the growth and lower the quality of the flesh of all fowls. There are many kinds of these insects; some cause itching of the skin, resulting in discomfort to the fowls and so loss of productivity; others injure the feathers; others burrow under the scales of the shanks and toes; others gnaw the skin and tissues; and others again suck the blood. Whenever fowls appear to be out of condition, the first thing is to ascertain whether their bodies are affected with any of these insects.

Cleanliness of the fowls and their surroundings is the first and most important consideration. Light, airy houses tend greatly to reduce infestation. Spraying the houses and surroundings as previously recommended should be periodically carried out. Opportunity of dusting themselves in soft earth should be given to the birds, and the earth slightly moistened with a weak solution of some disinfectant. Chickens should be dusted frequently with some insect powder. The birds should also be dipped periodically in a solution of kerol, izal or similar disinfectant and warm water as recommended above.

The Red Mite (Dermanyssus gallinæ).—This insect is only of a red colour when engorged with blood; when not

engorged it is yellowish, whitish or almost transparent. It hides by day in cracks and crevices. It often clusters in colonies, and where there is this congregation for a considerable time, mealy dust and webs may usually be found. The insect feeds on the body of the bird at night or when it is sitting or laying. If on the boards of the house, perches or nests are seen specks of black and white (which is the excrement) red mites are present, near by, in the cracks. If present in considerable numbers the birds will become droopy, weak, and their combs and wattles will be pale in colour. Sitting hens will desert their nests or be found dead on the nest. All the birds subject to the attacks of these insects are so weakened as to become susceptible to various diseases. The complete life cycle of the red mite from the egg to an adult is seven days only; it will then live for four or five months, even if the fowls have been taken out of the house.

Treatment.—The roosts should be taken out of the house; also all unnecessary boards and boxes, and the house well sprayed, care being taken that the disinfectant be applied from all angles and thoroughly forced into cracks. The floor too should be treated in the same way. The solution should be applied as hot as possible. No matter what disinfectant is used, the success depends chiefly upon the thoroughness with which the spraying is carried out. All perches, nests, etc., should be treated in the same way.

The Leg Scabies Mite (*Sarcoptes mutans*).—This insect, which causes *scaly leg*, is a very common one in this Colony and elsewhere. Although usually attacking the shanks and feet, it sometimes also attacks the comb and neck. It burrows under the scales, causing the shanks to assume an uneven appearance and to become crusted with mealy substance. Intense itching accompanies this, the legs and feet often become badly distorted, and the birds are sometimes unable to walk. It can therefore be fully realised that such a condition undermines the health and vigour of the bird and causes unproductiveness. As the mites are transferred from one bird to another, scaly leg fowls should be treated promptly. The perches should be rubbed over periodically with a rag dipped in paraffin, and some kerol, hycol, etc., poured into the sockets. The legs and feet should be soaked in or scrubbed with warm soap-suds, and then greased with

sulphur and lard, or lard and kerol, or lard and 6 per cent. carbolic acid or carbolised vaseline. The treatment should be carried out daily until the birds are cured. Many birds put on shows lose points for this condition.

Depluming Mite (*Sarcoptes salvis*).—This burrows into the skin near the base of the feathers and produces intense itching, causing the fowls to pull their feathers out until they are almost naked. The head and neck are the parts usually affected. Repeated applications of sulphur ointment will effect a cure.

Lice.—These are frequently found in some form or other on the bodies of chickens and adult fowls. Unlike the mites, these remain on the fowl constantly. All have a flattened form and are fitted with various spines and peculiarly modified legs. They do not suck the blood, but subsist on the waste matters of the skin and feathers. Their presence is, however, very irritable to the bird, and for this reason it is not so productive or healthy as it would be if free from them.

Symptoms of lice infestation in chickens are droopiness, lowered wings and ruffled feathers, often diarrhœa and death. Adult birds may not show any ill effects, but the egg yield decreases, unfertile eggs result, there is loss of weight, and also tendency (due to lowered vitality) to other diseases.

The Head Louse (*Lipeurus heterographus*) is usually found on the head and neck of chickens. It is not very common in Rhodesia, but it is prevalent in Great Britain, America and Australia, and is responsible for the deaths of many chickens in these countries. It is of a darkish grey colour, about 1-10 inch in length, and is found on the top and back of the head. It passes readily from one chicken to another, and from the hen to her brood. Application of blue mercurial ointment is recommended for the elimination of this louse.

The Body Louse (*Menopon biseriatum*).—This is the insect often seen (when the feathers on a fowl are raised) running quickly about the body; it is usually found on the breast, wings and around the vent. It is of a dirty straw colour. The eggs are seen in clusters at the base of the feathers. They hatch in about a week after being laid, and

the adult stage is reached in about 18 days from the time of laying the eggs. The best method of getting rid of these body lice is by dipping.

Other lice are: (1) *The Shaft Louse*, which is small, light yellow, and is found on the shafts of the feathers. (2) *The Wing Louse*, which is dark grey, with an elongated body, and found usually on the wing feathers. Its movement is rather slow. (3) *The Fluff Louse*, which is small, broad and translucent. As its name implies, it is found on the fluff. (4) *The Large Hen Louse*, which is nearly ⅛ inch in length and very broad in proportion. In colour it is smoky grey, in some cases almost black, and with darker patches on the sides of the abdomen. The treatment for the elimination of the above lice is also dipping.

Fleas.—Of these we have the ordinary bird flea, which is usually found on the neck or beneath the breast. It is also found moving about freely in the house. It is generally introduced in litter, and increases very rapidly. Thorough spraying will keep fleas in check; dusting powdered or well-slaked lime will assist in destroying them.

Sand Fleas are so called because they lay their eggs below the surface of dry, pulverised earth or sand, or between the interstices of a brick floor or cracks in cement, etc.; in fact, anywhere where dust or dry sand is present. They are by far the worst and most prevalent of the external parasites in this Colony, and during the hot weather are a serious pest to poultry. They are small, dark brown insects, and are found in clusters on the head and neck parts of the bird, and attached tightly to the skin. They multiply very rapidly, and unless thorough and constant measures are taken for their extermination, quickly affect the whole flock of birds.

A hard smooth floor, preferably of cement, without crack or crevice, in the poultry house is the best preventative. This should be sprayed frequently with a disinfectant and hot water, and the ground surrounding the house should be treated in like manner. The heads of the birds should be periodically (during the hot season, when these insects are most numerous) rubbed with carbolised vaseline. Thorough and constant spraying, as above, of houses and surroundings is prescribed, also a free use of powdered *well-slaked* lime. The insects found on the heads of the birds should be rubbed

with blue mercurial ointment, but the treatment and extermination of these is of no avail unless the floor of the house and the surroundings are also treated as advised, for no sooner are the fleas attached to the heads of the birds destroyed than others are continually hatched below the surface of the sand or dust, and rise to take their place. The poultry keeper should be always on the *qui vive* during the hot weather for these pests, and on their appearance adopt immediate and drastic measures for their destruction. Constant and thorough war must be waged against them if success is to be attained.

If the fowls and their surroundings are thoroughly clean and free from parasites, the poultry keeper should do his utmost to keep them so by not allowing other poultry to come in contact with them. Never bring any other fowls on to the place which have not been thoroughly examined for insects. See that any new birds have been well dipped twice before their introduction; never allow second-hand crates on the place without their being well disinfected beforehand. The possibility too of parasites being carried from infested quarters on boots, clothing, wagons, etc., should be realised, and also their conveyance by wild birds.

Above all, the birds should be kept in vigorous condition, for diseased birds or those with malformations of any kind readily fall a prey to parasites. If every poultry keeper would adopt the above precautions, and would constantly wage war on poultry parasites, we should have a far more vigorous and healthier stock of poultry in Rhodesia than we have, and the production both of birds and eggs would more rapidly increase.

Diseased Plants for Examination.

COLLECTING AND DESPATCHING THE MATERIAL.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad),
Government Mycologist.

In the examination of diseased plant material the problem which confronts the mycologist divides itself into four classes. The questions that have to be answered are whether the affection is caused by—

(i.) a parasitic organism;

(ii.) mechanical agency, such as wind or rain;

(iii.) some abnormal physiological condition of the plant;

(iv.) a combination of the above three factors.

It therefore becomes evident that the better the condition of the material received and the more details supplied, the simpler becomes the task of investigation and the more reliable the result. A few notes upon collection and despatch of material are appended for the guidance of those desirous of submitting specimens for examination.

Obviously the most important consideration is that material should reach the laboratory in a state as nearly as possible representing its original condition in the field, since the more common diseases may usually be identified by the symptoms produced upon the host plant and confirmed by a rapid examination under the microscope. With rare or undescribed diseases the necessity for a full description of the symptoms and habitat of the plant becomes even more essential, because a parasitic organism is not always responsible for unhealthy growth, soil particularly and atmospheric conditions often producing disease, and in these

cases the general appearance of the leaves, stems or fruits, as the case may be, is the only indication of the origin of the trouble.

Now in ordinary routine examination the outer surface of the material is sterilised and the sample is then placed under a glass cover in an atmosphere kept humid by means of damp, sterile blotting paper. After a few days any organism which may be present usually grows from the internal tissues and becomes apparent to the naked eye. This organism is then isolated and examined microscopically. During this period an examination has been made of the material as it arrived in the laboratory, and as a result of these two investigations a diagnosis can usually be made. It follows then that a complete diagnosis can only be made with difficulty from very meagre specimens or those which have become rotten. Because, in the first case, all the material must be used in the preliminary examination, leaving no reserve in case of doubtful result; and in the second case moulds, mildews and bacteria usually overgrow and mask the actual causal organism. It is therefore expedient to send an ample quantity of specimens, preferably in various stages of development of the disease. Similarly it is useless to send a description alone, no matter how detailed, of the affection unless it is accompanied by samples upon which sufficient care has been expended to render them immune from damage in transit or to contamination by saprophytic organisms.

The chief points to be observed are summarised below in as concise a manner as possible:—

(1) COVERING LETTER.

Give as full description as possible of:—

(a) Symptoms of disease, and whether confined to any particular part of the plant.

(b) Nature of site and soil, fertiliser treatment, etc.

(c) Climatic conditions.—

(i.) During the year.

(ii.) Within the last two weeks.

(d) Age of crop; whether growth uniform.

(e) Whether disease has been observed previously, and where.

(f) Any insect prevalent.

(g) Other notes of interest.

(2) COLLECTING.

(a) Collect material just before or on mail day.

(b) Choose the most typical specimens of early, medium and advanced disease, labelling each.

(3) PACKING.

(a) Leaves.—

(i.) Lay flat in newspaper, two or three thicknesses between each specimen.

(ii.) Roll up fairly compactly and protect from wet and external damage by brown paper or cardboard.

(iii.) If likely to take more than three days in transit, dry the leaves in the sun between blotting paper for one day before despatch.

(b) Roots and Stems.—

(i.) Do not pull up plants, but carefully dig round in order to damage as little as possible the tender lateral roots which may show first stages of disease.

(ii.) Shake out some of the soil without destroying the roots. This can be done by immersing in water.

(iii.) Dry, wrap in newspaper and pack in a box.

(iv.) With stems, send at least four samples, each of 1 foot to 2 feet in length.

(c) Fruits and Tubers.—

(i.) Wrap each specimen in newspaper and pack carefully in a box with dry cotton wool or screwed up newspaper in order to avoid bruising in transit.

(ii.) State in letter whether there is any die-back of branches or spotting of leaves. Send samples.

In conclusion it should be explained that symptoms apparently identical in appearance are produced on different species of plants by quite distinct organisms, and the fact that a white fungus, say, appears upon the roots does not necessarily mean that the same disease is present in each case. Bacterial, fungoid, soil or climatic conditions may initiate the pathologic condition.

Maize-Growing Competition.

The name of Mr. F. B. Morrisby, Sunnyside Farm, Gwelo, did not appear in the list which was forwarded to us for publication of entries for the maize competition. We understand that Mr. Morrisby has entered two plots.

Levelling for Irrigation.*

By Dr. W. S. H. Cleghorne, M.I.Mech.E.

Modern Methods.—To the farmer who practises irrigation the practical use of the surveyor's level is of great assistance. It illumines his path ahead of him, and by its use he may save himself the outlay of much money in wrong directions. It enables him to investigate proposed schemes as to their feasibility, and to forecast their approximate cost and payability, so that, before the sod is cut, he knows where he stands and to how much he will be committed if he decides to proceed with the scheme.

Not only is the level of use before a proposed scheme reaches the stage of construction, but its every-day use on existing irrigation schemes and lands is of great advantage.

That the foregoing statements are appreciated by many irrigators is proved by the considerable number of farmers practising irrigation who are in possession of a level and who make more or less intelligent and regular use of it. This article should be of use to these enterprising farmers, as well as to others who do not yet make use of a level in a systematic manner and to whom this article may afford help in that direction.

The chief difficulties encountered by the irrigator in the use of a level such as that used by the engineer or surveyor are its high cost and the difficulty its use presents to an inexperienced person. It is now possible, however, for the farmer to obtain instruments popularly known as cheap farmers' levels.

The type of farmer's level mentioned in this article is on the same principle as the modern engineer's level, but is smaller and simpler. Through engineers' and surveyors'

* Published in the "Farmers' Supplement" of the *Sunday Times*.

levels objects are seen upside-down, but farmers' levels are made to show things right side up. This is a great help to the farmer, even although it necessitates the use of an additional lens, which results in the image being darker.

The level described (see Fig. 1) costs little more than one-quarter as much as the level commonly used by surveyors. Like other farmers' levels, it is designed for the use of people who do not possess the technical knowledge or training of a surveyor or engineer. Its use calls for no more than a little care and the exercise of common sense.

For one who wishes to carry out his own irrigation scheme without calling in the services of a highly paid surveyor or engineer, such an instrument is invaluable, although for schemes of magnitude professional guidance should be obtained. The level is useful also in the everyday practice of irrigation farming, for laying out and grading beds, field furrows, etc.

The latest model of this level is fitted with a graduated, horizontal circle (P, Fig. 1), which enables it to be used for setting off given angles from any line of sight, for setting out foundations for buildings, boundary fences, etc., for planting trees, and for measuring irregularly-shaped areas of land.

Description of Level.—The instrument consists of a telescope, with an object glass one inch in diameter, and a magnification of ninefold. The object is seen right side up, not, as in the ordinary engineer's level, inverted. This makes the reading of the levelling staff easy. On top of the telescope is a spirit-level, H, the bubble of which is viewed from the eye-end of the instrument by reflection from the mirror K, on the underside of the hinged lid, when the latter is raised to about the angle shown. When folded down this lid protects the bubble tube. The large screw E, called the "gradienter" screw, cants the telescope about the pivot L, to give any desired grade. M is a spring buffer, which yields in a downward direction when the gradienter screw is moved upwards, and which presses upwards and returns the telescope when the gradienter screw is moved downwards.

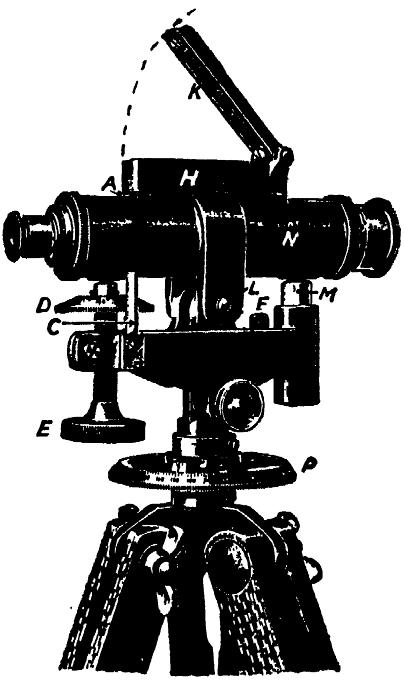
D is a divided head on the gradienter screw which enables the telescope to be canted correctly to set out to any

given gradient. This does away with the necessity for calculations and confusion arising from the use of figures by the unpractised person.

All the parts mentioned are carried on a strong and rigid tripod.

F is a "pill-box" spirit-level, by the help of which the instrument is preliminarily levelled by moving one or more of the legs of the tripod either outwards or inwards until the air-bubble comes to the centre.

Within the telescope there is a horizontal pointer projecting into the field of view from one side, and with its point coincident with the centre line or axis of the telescope. The position of the point is read on the levelling rod or target, a description of which follows.



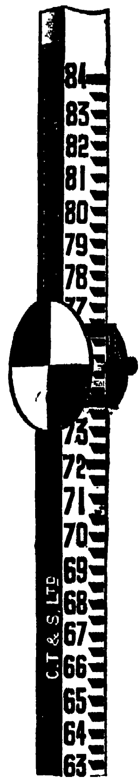


Fig. 1. Fig. 2.—Levelling staff with sliding target.

The Levelling Rod.—The levelling rod or target staff is 7 feet long, divided on one edge to quarter inches. It is provided with a target (see Fig. 2) which is free to slide up or down the staff until clamped in any desired position by a milled-head screw. This target makes an easily seen mark upon which the telescope of the level can be sighted. This method of sighting on to a target is more accurate and less fatiguing to the eye than reading the graduations of the staff direct by the telescope, which is rather a difficult and confusing process to inexperienced persons, except possibly at short distances.

The staff holder moves the target up or down the staff according to instructions received from the observer at the telescope. Finally, if necessary, the position of the target on the staff can be readily noted on the graduated edge of the staff by the staff holder.

Care should be taken to hold the staff truly vertical when the observer is sighting on it with the telescope.

Setting up the Level.—Plant the level in a suitable position on firm ground. Move one or more of the tripod legs about till the bubble of the pill-box spirit-level, F, comes approximately to the centre. This is easily and quickly accomplished, because the pill-box spirit-level is purposely made not too sensitive. It levels the instrument only approximately. Next, the telescope is adjusted optically by focussing it till both pointer and levelling staff are clearly seen.

The gradienter screw, E, is used for the final and accurate levelling of the telescope, before the latter is used for sighting on target or staff. This is done by bringing the long bubble, placed on the top of the telescope, to the middle of its run by the use of the gradienter screw.

Setting the Telescope.—Setting the telescope to a given grade is also done by the gradienter screw, a divided head, D, being provided to measure the slopes or gradients given to the telescope. The construction of this level is, in fact, very similar to that of the latest engineer's level.

First, set up the instrument as explained and bring the long bubble to mid-run (after the telescope has been pointed

in the correct direction—i.e., towards the staff) by means of the gradienter screw E. The divided head D fits merely friction-tight on screw E and can be rotated on the latter,

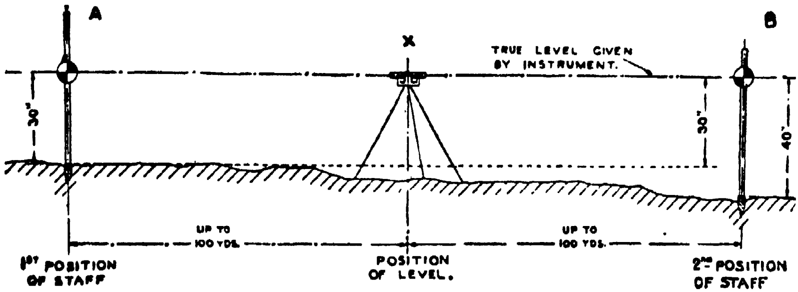


Fig. 3.
Finding the difference in level between two points (A and B).

care being taken to hold the screw E with the other hand at the same time to prevent its turning and so disturbing the long bubble. In this way D is turned independently of screw E until the line on it engraved "level" comes opposite the fixed index C. The divided head bears other engraved (radial) lines corresponding to different slopes of the telescope. If the screw-head E be now revolved far enough to bring one of the other engraved lines, say the one engraved 200, opposite the index C, then the telescope will have been tilted to a gradient of 1 in 200, which is the same thing as 1 foot in 200 feet. The other gradients that are marked on the instrument are those most likely to be used by the farmer, namely:—

6 inches in 100 yards equal 1 in 600.
9 inches in 100 yards equal 1 in 400.
1 foot in 100 yards equals 1 in 300.
1 foot 6 inches in 100 yards equal 1 in 200.
2 feet in 100 yards equal 1 in 150.

Finding the Difference.—Referring to Fig. 3, suppose we wish to determine the difference of level between the two points A and B.

Set up the level equi-distant from the two points A and B. Direct the telescope on the staff held vertically on the point A and note the reading. Then let the staff holder

hold the staff vertically on the second point B, sight on it and note the reading there.

Care should be taken that the long bubble on top of the telescope is at mid-run while each reading is being taken. Say, for example, that the reading at A is 30 inches and that at B is 40 inches; this means that A is 30 inches and B 40 inches below the same horizontal line, namely, the line of sight through the telescope, or what is known as the line of collimation (see Fig. 3).

Therefore the difference of level between A and B is 10 inches, B being 10 inches lower than A.

Compound Levelling.—Should the distances between the two places A and B be too great to allow of the difference of level being observed with one setting up of the level, it becomes necessary to repeat the operation two or three times. Thus we might mark a point C half way between A and B. Find by the method described the difference in level between A and C, the level being set up half way between these two points. Then, setting the level up half way between C and B, we find the difference in level between them by a repetition of the method.

Suppose that from the first setting up of the level we find that C is 10 inches lower than A, and from the second setting up that B is 4 inches higher than C; then we deduce that B is 6 inches lower than A.

Obviously, for greater distances between A and B, the method can be extended to three or more settings up of the level, the work then being called compound levelling.

A Contour Line.*—A contour line is a line which follows the natural irregularities of the ground and all points on which are at the same level. For instance, the margin of the still water of a reservoir is a contour line. In practice it is often necessary to set out such contour lines; for instance, in terracing land or preliminary to making contour banks or "levees." To set out such a contour line proceed as follows:—

* Not to be confused with the "contour ridge" as advocated by this Department for the prevention of soil erosion.

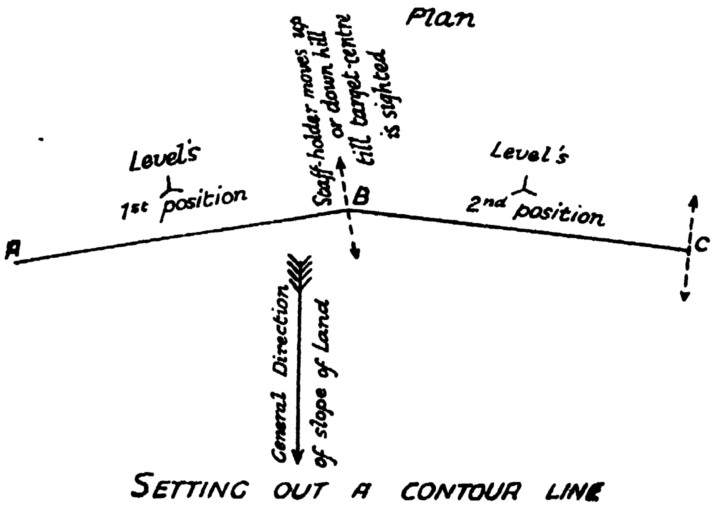


Fig. 4.

Suppose that A (Fig. 4) is a point known to be on the required contour line, e.g., the commencement of the latter, and that we require to find other points on the contour line passing through A. These points may be any distance apart, according to how accurately we wish to work out the contour line. Twenty-five or fifty feet is a common distance—i.e., the second point B will be approximately 25 (or 50) feet from A, while the third point C will be 25 (or 50) feet from B, and so on.

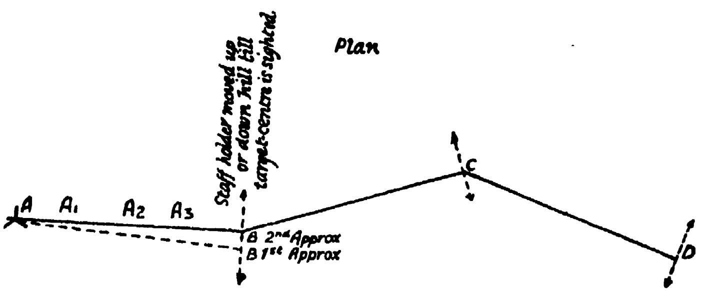
Set up the level about midway between A and where we judge the second point B will lie on the required contour line. The exact position of B is still to be found. To find it proceed as follows:—Sight on the staff held on A and signal the staff holder to raise or lower the target until its centre coincides with the pointer in the telescope, or rather appears to do so. Next let the staff holder clamp the target in that position and take the staff to the other side of the level near to where we judge the point B to be. Let him erect the levelling rod there. Turn the telescope to point towards B, and if the long bubble moves bring it back to mid-run by the gradienter screw. Look through the telescope and signal the staff holder to move either up or down hill, holding the staff vertical and with its base on the

ground, while a sight is being taken, as required, till the pointer of the telescope again appears to coincide with the centre of the target. This will give the exact position of B on the same level as A.

Pegging the Points.—By repetition, i.e., by setting up the level about half way between B and where we judge a third point C (25 or 50 feet further on than B) will be on the contour line, and proceeding as before, treating points C and B in the same way as we previously treated A and B, we find a third point C on the required contour line.

The points A, B, C, etc., may be marked with pegs as we go along, till finally the whole contour line has been pegged out.

Care must be taken during all observations from one station not to interfere with or disturb in any way the legs of the tripod, which must not be changed from the position in which they were originally placed when setting up at that station. If by accident the tripod should be knocked out of position by the observer's foot, or in any other way, the levelling must begin again from the beginning so far



SETTING OUT AN IRRIGATION CANAL WITH A UNIFORM GRADE
Fig. 5.

as that station is concerned. These remarks apply, of course, in general, not alone to setting out a contour line.

Setting out a Canal.—To set out the course of an irrigation canal with a constant grade. Suppose the canal is to commence at A (Fig. 5). Set the level up there, first adjusting the legs of the tripod till the bubble of the pill-box level comes to the centre. Next point the telescope in the

direction that it appears the canal will take, and, by means of the gradienter screw, bring the long bubble (on top of the telescope) to mid-run. Then hold the levelling staff vertically, with its base on the ground, alongside the level, and clamp the target at the same height above the ground as the centre of the telescope.

Next give the desired grade or tilt to the telescope by rotating the gradienter screw, as already explained.

The staff holder then takes the staff to a point about where it is judged the canal will pass. To locate this point, which we will call B, the observer looks through the telescope at the staff held vertically by the staff holder with

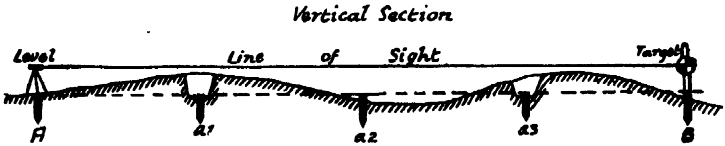


Fig. 6.

its base on the ground near to the assumed position of B, and signals the staff holder to move up or down hill till at last the centre of the target coincides with the pointer of the telescope. This locates approximately the point B on the required falling contour.

It is desirable, however, to locate B with still greater accuracy. To do this the tilt of the telescope should be re-set by first setting the telescope level again (while still pointing to the last-found approximation to the position B) and then giving it the correct tilt by means of the gradienter screw. It may then be found that the staff has to be moved a few inches up or down hill in order that the centre of the target may be sighted.

Intermediate points A1, A2, A3 on the same grade and on the straight line joining A to B may be marked similarly by holding the staff (without altering the position of the target on it) on a peg at A1 and driving in the peg till the centre of the target comes to coincide with the pointer of the telescope. Proceed similarly for A2, A3, etc.

If the ground at A1 is low, a long peg will have to be used, and in its final position will project considerably above

the natural surface of the ground. On the other hand, if the ground at A1 is high it will be necessary to excavate a hole of sufficient depth and drive in the peg to the correct level at the foot of the hole.

Reading the Result.—A too long peg or an unduly deep hole at intermediate points, such as A1, A2 or A3, indicates that too much filling or cutting will have to be done when the construction of the canal is carried out.

The setting out of section A B should be re-done, this time taking B sufficiently near to A to prevent too great a divergence between the grade levels at A1, A2 or A3 and the levels at these points respectively of the natural surface of the ground.

The next section of the canal, B C, is pegged out in a similar fashion by setting up the level at B, a new height of target on staff being adopted equal to the height from ground surface to the centre of the telescope in the new position of the instrument.

In a similar way succeeding sections of the canal, C D, E F, etc., are pegged out.

For a uniform grade, of course, the tilt of the telescope, once given, is left the same from the head to the tail-end of the canal.

The foregoing method will result in the canal being set out in straight reaches or lengths, which, in construction, may be connected by gentle bends. This is considered to be a good alignment. The straight lengths will be longer or shorter, according as the country is more or less regular, topographically, and according to whether a greater or less depth of cutting and filling is considered desirable.

An Irrigation Bed.—To peg out the grade for an irrigation bed: Referring to Fig. 6, suppose we wish to grade from A to B. First, set up the level in the manner already explained, with the telescope truly horizontal, at the point A, as shown in the sketch. Then hold the staff alongside the level and with its base on point A, and clamp the target at the same height above the ground as the centre of the telescope. Now if the desired grade or tilt be given to the telescope by rotating the gradienter screw E and the staff be erected at any desired point, such as A1, A2, A3 or B,

at such a height as to bring the centre of the target on to the pointer as seen when looking through the telescope, then the base of the staff will be on the desired grade.

In other words, if a wooden peg be driven into the ground at any desired place till, when the staff is erected upon it, the centre of the target and the pointer, seen when looking through the telescope, coincide, then we know that the top of the wooden peg which has been driven into the ground is on the desired grade from the point at which the level is set up.

Care must be taken not to alter the position of the level or to unclamp the target on the staff during these operations.

Due to irregularities of the ground, it may be necessary to use long pegs projecting well above the ground in low places, and to dig holes in high places. In the sketch, projecting pegs have had to be used at A2 and B, while holes have had to be dug at A1 and A3.

The divided head D (Fig. 1) is engraved with divisions and their corresponding figures running in two opposite directions. This arrangement allows of rising as well as of falling grades being set out, according to which way the screw is rotated.

Use of Pegs.—It is good practice, ensuring greater accuracy, to drive wooden pegs into the ground at those places where the staff is erected. This method is more systematic than and preferable to erecting the staff on the bare ground itself.

As many pegs as are deemed necessary can be placed in the ground, and the use of a length of string or wire or a piece of straight wooden board laid from peg to peg will allow of canals, irrigation beds, etc., being constructed to a uniform grade throughout.

Grade to be Given.—It lies with each individual farmer to decide what grade shall be given to his irrigation beds; experience is the best guide. Sufficient velocity must be imparted to the water to carry it to the far end of the bed within a reasonable interval of time, yet the slope must not be so great as to cause excessive velocity of the water, with consequent washing away of the soil. Some soils, of course,

will wash away more easily than others, and the limiting slope in the case of the former would therefore be less than in the case of the latter.

The slope to be given to a canal depends on many factors, such as the size and shape of cross-section of the canal, the relation of depth of water to width, the kind of soil in which the canal is excavated, or, if the canal is lined, the roughness of the lining. It is therefore a complicated matter to calculate the correct slope for a given canal (though this is done by engineers for each individual case), and no one can say off-hand what slope a proposed canal should have. Merely as a rough guide, however, the following figures are appended:—

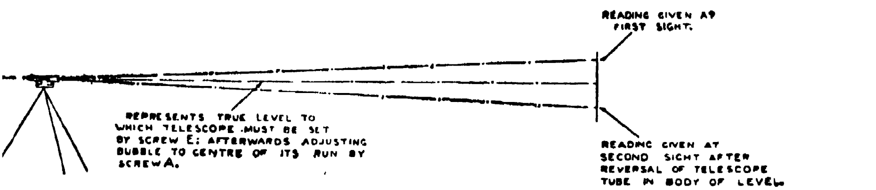


Fig. 7.

In an ordinary farm canal, with a bottom width of 3 or 4 feet, a suitable grade is 1 in 1,000. If desired—dependent upon the nature of the soil—grades as nearly flat as, but not flatter than, 1 in 2,000 may be adopted.

Testing and Adjusting.—The telescope of the level is made as a separate part, which fits snugly into an outer sleeve, N (Fig. 1)—part of the body casting—and can be withdrawn therefrom when this is required to be done for the purpose of testing the instrument.

To test, first set up the level on its tripod and bring the long bubble to the middle of its run in the usual way. At a convenient distance erect the staff, sight on to it and clamp the sliding target at the height at which the pointer of the telescope coincides with the centre of the target. (See Fig. 7, "Reading given at first sight.")

Next, unscrew and remove the milled-edged retaining ring at eye end of telescope (shown immediately above D in Fig. 1), and then grasp the object glass end (the large end) of the telescope and, without shifting the level otherwise,

pull the telescope out of the body casting. Turn the body of the level half way round about the vertical pivot so that the ends of the sleeve N (Fig. 1) are reversed, and re-insert the telescope pointing as before towards the staff.

Again bring the long bubble to mid-run by means of the gradienter screw, and note whether the pointer of the telescope coincides with the target again. If the telescope sights the target exactly as on the first occasion, the instrument is in perfect adjustment.

On the other hand, if at a second reading it is found that the pointer of the telescope does not sight exactly on the centre of the target, move the target on the staff until coincidence between the telescope pointer and the centre of the target is effected. Note the difference between the two readings and clamp the target half way between the first and second positions. For example, say the first reading was 54 inches and the second 60 inches, then the difference is 6 inches, and in this case the target should be clamped at 57 inches.

Having done this, sight the telescope on the target, bringing the pointer of the telescope into coincidence with the new position of the target by means of the gradienter screw. This will displace the long bubble from mid-run position. Bring it back to mid-run by turning the screw A (Fig. 1).

A Second Test.—The instrument will now be in correct adjustment, but should be re-tested as before. If found correct on second test, we know that the telescope and long bubble are parallel to each other, and that the line of sight is truly horizontal when the long bubble is in the middle of its run.

The adjustment can also be readily tested or corrected on a post or door, etc., without the use of the staff by fixing up a piece of stiff white paper and marking thereon by a pencil the two sights given by the telescope before and after reversal end-for-end.

If the instrument is in correct adjustment the two sights will coincide, but if it is not, then a third mark made half way between the two already on the paper will be the true level at which to set the instrument.

This is done, of course, as already explained, by first bringing the pointer of the telescope to this mid-way mark by means of the gradienter screw E, and then bringing the long bubble to mid-run by the screw A (Fig. 1).

The instrument should be tested and, if found necessary, adjusted in the manner described before commencing any new work, and it is also advisable to test the level at the end of a long piece of work in order to be quite sure that it has not varied in the course of the work.

An instrument is of little use to a farmer unless he can easily test its accuracy in some such way as that described above.

Smithfield Prices.

Messrs. Hart, Harrison & Co., 4 and 5, West Smithfield, London, have kindly forwarded us the following prices prevailing on the 24th February:—

London Central Markets.—Beef: Supplies abnormal, consequently prices very low, particularly for Argentine chilled beef. No frozen beef marketed. Frozen pork: Slow sale, prices weaker.

English long sides, 7d. to 8d. per lb.
Irish long sides, 7d. to 8d. per lb.
Canadian long sides, 7¼d. to 7¾d. per lb.
Argentine chilled hinds, 4d. to 4¾d. per lb.
Argentine chilled fores, 2¾d. to 3d. per lb.
Frozen pork: South African, 5d. to 6d. per lb.
Frozen pork: New Zealand, 6½d. to 9d. per lb.

Southern Rhodesia Veterinary Report.

December, 1926.

AFRICAN COAST FEVER.

UMZINGWANE DISTRICT.—A fresh outbreak occurred on the farm The Range, adjoining the previously infected farm Glen Lategan. The mortality during the month was as follows:—The Range, 17; Essexvale South, 117.

MATOBO DISTRICT.—No fresh outbreaks. The mortality at existing centres of infection was 7 head.

UMTALI DISTRICT.—No fresh outbreaks. Seven head were destroyed on the infected farm Zimunya's Town.

MELSETTER, MAZOE AND GWELO DISTRICTS.—No cases of disease at any of the infected centres.

ANTHRAX.

An outbreak of anthrax occurred in the Lalapanzi section of the Gwelo district. Five head of cattle and four pigs died. All the in-contact cattle were vaccinated. In the Ntabasinduna Reserve, Bubi district, three cases occurred.

HORSE-SICKNESS.

The following mortality was reported:—Inyati, 1; Bulawayo, 3; Antelope, 1; Victoria, 1.

IMPORTATIONS.

From the Union of South Africa:—Bull, 1; cows and heifers, 15; horses, 16; mules, 4; sheep, 885; goats, 107; pigs, 3.

EXPORTATIONS (CATTLE).

To Union of South Africa:—Slaughter cattle for consumption in the Union, 337; slaughter cattle for overseas

export via Johannesburg, 21. Slaughter cattle to Belgian Congo, 1,012. Slaughter cattle to Portuguese East Africa, 104.

EXPORTATIONS (MISCELLANEOUS).

To Belgian Congo, 42 pigs; to Northern Rhodesia, 46 pigs; to Portuguese East Africa, 35 goats and 45 sheep.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Movements of New Settlers.

New Arrivals.—The following new settlers arrived in the Colony during the month of February, 1927:—

C. J. Cooper.—Arrived from Union on 1st February, and has been viewing land in various districts.

Mr. and Mrs. F. G. Sandeman.—Arrived from England on 4th February, on tour of inspection. Mr. Sandeman has been temporarily accommodated with Mr. G. A. Dobbin, and Mrs. Sandeman has returned to England for the time being.

B. D. Barnes.—Arrived from England on 4th February, and is now with Mr. J. Dennis, Pendennis, Salisbury.

Mr. and Mrs. J. H. Lawrence.—Arrived from England on 4th February, and are reported to have joined Mr. C. H. Berrett, Goromonzi.

Capt. F. J. T. Frost.—Arrived from England on 7th February, and has been viewing land in various districts.

N. A. R. Milne.—Arrived from England on 9th February, and is staying for a short period with Mr. A. Gilchrist, The Warren, Salisbury.

L. Evans.—Arrived from England on 11th February, and proceeded for a period of training to Mr. H. B. Christian, Arcturus.

G. L. Elliott.—Arrived from England on 18th February, and proceeded to Mr. O. C. Rawson, Darwendale.

— Beatty.—Arrived from England on 18th February, and joined Mr. D. A. Vaughan Clark, Arcturus.

— Whitehead.—Arrived from Union on 18th February, and joined Mr. G. Brisley, The Pines, M'sonneddi.

G. R. Moser.—Arrived from England on 20th February, and is now with Major Perrins, Bembesi.

J. T. Mungle.—Arrived from England on 21st February, and is staying for a time with his brother, Mr. J. Mungle, Odzi.

Mr. and Mrs. A. MacGregor.—Arrived from England on 25th February, and are viewing land in various districts.

Major and Mrs. Parselle.—Arrived from England on 25th February, and have been accommodated on Wensleydale, Macheke.

T. Chisholm.—Arrived from England with his son and joined Mr. Wetherburn on Harlech Farm, Salisbury.

Southern Rhodesia Weather Bureau.

FEBRUARY, 1927.

The barometric pressure for the month was generally below normal in the north and west and slightly above normal in the east. Livingstone showed the maximum, being 0.049 inch below normal. Fort Victoria was 0.005 inch above normal. There were six low pressure systems which affected this country. A northerly low of fair intensity entered the country from the north-west on the 1st, passed to the south of Salisbury on the 2nd, and, moving in a south-easterly direction, was well off the coast on the 3rd; it then moved away north along the coast. Its effect was intensified by the presence of a low to the south on the 1st and 2nd. On the 5th an intense low appeared off Durban, and moved up the coast to Lourenco Marques on the 6th and Beira on the 7th. This low retained great intensity throughout its course. A northerly low was present round Mozambique from the 11th to the 14th and had considerable effect on local pressure. A low, apparently northerly, appeared at Kenhardt on the 20th, was off the south coast on the 21st and 22nd, and moved to the interior on the 23rd. A southerly low moved from the south coast on the 26th to the east on the 27th and appeared off Beira on the 28th; its effect was greatly enhanced by the presence of a northerly low to the west from the 24th to the 28th. Five high pressure systems affected the local pressure during the month. A high of considerable intensity was present to the south of Rhodesia on the 8th, 9th and 10th. This was followed by a southerly high which moved from the west coast to the south-east coast on the 11th, where it remained until the 14th. It then moved inland on the 15th and was in evidence to the south of Rhodesia on the 16th. A further high appeared off the south-east coast on the 18th and moved north, affecting local pressure on the 19th and 20th. This high was followed immediately by another on the 21st and 22nd. No further highs occurred until the 28th, when one appeared off the south-east coast.

Temperature.—During the month the mean temperature was about normal, varying from 2.2° F. above normal at Matopos to 3.0° F. below normal at Shamva.

The mean maximum temperatures were above normal, varying from 7.8° F. above normal at Tuli to 4.4° F. below normal at Riverdene North.

The mean minimum temperatures were about normal, varying from 4.8° F. below normal at Shamva to 1.1° F. above normal at Sipolilo.

Humidity was generally below normal, varying from 8 per cent. below normal at Fort Victoria to 2 per cent. above normal at Salisbury.

Rainfall.—The mean rainfall over the country amounted to 5.71 inches as compared with a normal of 6.08 inches. The seasonal total to the end of the month amounts to 17.62 inches as compared with a normal of 23.45 inches.

The mean rainfall as recorded in the zones is as follows:

	February, 1927. Inches.	Normal, February. Inches.
Zone A	6.27	5.00
Zone B	2.63	3.92
Zone C	6.90	7.32
Zone D	8.03	7.73
Zone E	5.56	6.86
Zone F	7.96	10.69

In Zone A the district with the greatest mean rainfall was Sebungwe with 11.03 inches, and the district with the least mean rainfall was Nyamandhlovu with 2.55 inches.

In Zone B the district with the greatest mean rainfall was Belingwe with 3.77 inches, and the district with the least mean rainfall was Chibi with 1.43 inches.

In Zone C the district with the greatest mean rainfall was Hartley with 9.19 inches, and the district with the least mean rainfall was Salisbury with 4.27 inches.

In Zone D the district with the greatest mean rainfall was Mazoe with 6.57 inches, and the district with the least mean rainfall was Mtoko with 3.78 inches.

In Zone E the district with the greatest mean rainfall was Charter with 7.64 inches, and the district with the least mean rainfall was Insiza with 2.43 inches.

In Zone F Umtali had 9.10 inches and Melsetter had 7.87 inches.

Rain Periods.—There were three periods of general rain during the month connected with the most marked movements of lows. Rain was general on 1st and 2nd, 6th and 7th, and on 26th, 27th and 28th. The first period was due to the northerly low which passed through the country; the other periods were due to lows passing up the east coast. Showers were reported from north and north-east Mashonaland on the 3rd, 4th and 5th; light showers occurred in the north on the 8th and 9th. The proximity of a high resulted in two days (10th and 11th) without rain, followed by light showers on the 12th, and showers in south-east Mashonaland and eastern border on the 13th. The effect of the northerly low shows in the showery weather which occurred in north and east Mashonaland on the 14th, 15th, 16th and 17th. Isolated showers occurred on the 18th, followed by showers in south-east Mashonaland and Matabeleland on the 19th and 20th and south Mashonaland and eastern border on the 21st; these were probably due to the influence of a small low, which affected the east coast pressure on the 20th and 21st. On the 22nd rain was general in north Mashonaland, followed by showers on the 23rd and isolated showers on the 24th; the pressure during this period was high to the south and low to the north-east. On the 25th rain occurred in the west, and on the 26th and 27th extended over the whole country except north-east Mashonaland. On the 28th the arrival of a southerly low off Beira caused general rains.

RAINFALL.

Station.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	2.46	2.24	11.07	19.22
Imbesu Kraal ...	...	...	...	20.05
Inyati ...	2.39	3.26	11.97	20.56
Judsonia ...	.95	2.64	9.65	n.s.
Martha Farm ...	3.58	3.11	12.93	n.s.
Shangani Estate ...	3.27	2.45	12.85	18.95
Bulalima-Mangwe—				
Centenary ...	1.97	3.31	11.54	n.s.
Kalaka ...	4.79	2.75	14.07	18.79
Riverbank ...	2.36	1.79	12.49	19.25
Solusi Mission ...	5.74	3.81	14.24	20.06
Bulawayo—				
Fairview Farm ...	2.13	3.51	12.63	18.38
Keendale ...	5.91	3.70	14.04	18.08
Lower Rangemore ...	2.47	3.44	12.46	19.54
Observatory ...	4.43	3.79	14.73	20.04
Gwelo—				
Dawn ...	2.19	3.94	11.74	20.64
Delano Estate ...	7.93	6.21	21.76	n.s.
Gwelo Gaol ...	3.44	5.12	19.59	21.90
Riversdale Estate ...	2.25	...	10.20	n.s.
Somerset Estate ...	2.77	5.56	16.28	20.92
Insiza—				
Orangedale ...	4.76	3.44	13.57	23.23
Shangani ...	2.19	3.11	11.35	19.36
Thornville ...	2.36	3.14	11.35	20.65
Nyamandhlovu—				
Edwaleni ...	1.72	...	6.99	19.33
Gwaai Reserve ...	3.24	2.70	12.87	n.s.
Impondeni ...	4.32	...	13.02	n.s.
Naseby ...	4.11	3.51	13.83	18.37
Nyamandhlovu Railway ...	3.44	1.44	11.04	18.81
Sebungwe—				
Gokwe ...	4.59	11.03	27.31	23.58
Umzingwane—				
Springs ...	3.03	4.70	15.60	20.19
Wankie—				
Matetsi Railway ...	6.53	5.95	23.85	24.68
Ngamo Railway ...	3.39	5.04	16.34	23.90
Sukumi ...	8.38	6.08	22.76	n.s.
Victoria Falls ...	8.29	3.60	20.55	23.10
Wankie Hospital ...	9.22	11.18	27.34	19.01
Waterford ...	9.62	4.43	17.68	...
Zone B.:				
Belingwe—				
Bickwell ...	5.70	3.77	14.73	19.77
Bulalima-Mangwe—				
Bruwapeg ...	1.91	2.36	9.41	n.s.
Edwinton ...	4.81	2.59	13.60	18.45

RAINFALL—*(Continued)*.

Station.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
Zone B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	3.81	2.36	12.20	17.90
Garth ...	4.98	3.02	18.15	21.10
Maholi ...	7.60	2.72	18.20	19.33
Retreat ...	5.19	3.24	13.83	18.30
Sandown ...	3.07	3.40	12 24	n.s.
Semokwe Reserve ...	.99	1.89	9.67	n.s.
Tjankwa ...	3.69	...	14.52	20.24
Tjompanie ...	...	2.89	15.17	19.32
Chibi—				
Nuanetsi Homestead ...	...	1.43	2.81	13.24
Gwanda—				
Antelope Mine ...	1.24	9.08	16.36	16.77
Gwanda Gaol ...	3.87	2.55	10.22	17.52
Limpopo ...	.49	.30	4.53	n.s.
Mazunga ...	1 24	...	5.24	13.70
Tuli ...	1.39	1.30	7.93	11.90
Insiza—				
Albany ...	2.59	2.32	10.89	18.72
Filabusi ...	3.94	.67	8.84	17.90
Fort Rixon ...	2.49	1.81	11.17	18.68
Inyezi	4.09	3.15	18.05	18.29
Lancaster ...	3.92	1.64	9.57	n.s.
Wanezi Mission ...	3.82	3 06	9.70	n.s.
Matobo—				
Bon Accord ...	3.06	4.36	11.33	n.s.
Fort Usher ...	3.30	3.41	16.60	n.s.
Holly's Hope ...	2.40	4.28	13.13	18.07
Longsdale ...	3.87	1.90	12.98	n.s.
Matopo Mission ...	2.71	3.10	15.33	22.07
Matopo School ...	1.20	2.31	14.54	n.s.
Mtshabezi Mission ...	3.62	1.68	8.38	18.56
Rhodes Matopo Park ...	5.94	1.11	15.14	19.95
Wenlock Ranch ...	1.26	1.78	7.63	n.s.
Umzingwane—				
Balla Balla ...	6.48	3.06	22.42	20.08
Essexvale ...	3.72	3.27	14.14	19.56
Heany Junction ...	2.85	2.09	15.16	21.77
Hope Fountain ...	1.48	4.42	13.45	21.32
Zone C.:				
Charter—				
Bushy Park ...	4.36	7.04	19·93	21.40
Enkeldoorn ...	2.44	7.65	27.04	21.99
Marshbrook ...	3 66	7.96	23.75	21.17
The Range ...	4 80	9.92	25.41	22.74
Vrede ...	3.24	8.90	12.14	21.22
Chilimanzi—				
Beacon Hill ...	4.31	5.63	18.80	n.s.
Central Estates ...	3.21	8.27	21.84	22 29

RAINFALL—(*Continued*).

STATION.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Chilimanzi (continued)—				
Fourie's Post ...	6.32	6.22	19.53	n.s.
Orton's Drift ...	3.68	4.55	16.59	22.29
Sebakwe Post ...	5.05	6.16	21.11	n.s.
Umvuma Railway ...	2.11	4.81	14.44	20.57
Gwelo—				
Cross Roads ...	3.61	9.16	18.97	19.64
East Clare Ranch ...	1.16	6.28	16.55	n.s.
Globe and Phœnix Mine ...	2.53	5.80	15.96	20.35
Indiva ...	3.28	7.52	16.77	n.s.
Iron Mine Hill ...	3.92	6.64	21.55	n.s.
Lyndene ...	3.91	5.34	16.32	n.s.
Lannes Farm ...	2.45	7.68	17.32	n.s.
Rhodesdale Ranch ...	4.92	8.92	21.89	20.06
Woodendhove ...	6.94	7.53	25.59	21.29
Hartley—				
Ardgowan ...	7.75	9.47	28.51	23.00
Balwearie ...	4.88	8.61	24.41	n.s.
Battlefields ...	3.56	10.19	26.01	20.89
Beatrice ...	3.75	11 31	26.41	23.71
Carnock ...	5.01	6.66	24.59	22.97
Cromdale ...	4.00	7.59	24.78	n.s.
Deweras Store ...	3.34	10.04	25.41	n.s.
Eiffel Blue Mine ...	4.80	11.28	25.24	n.s.
Elvington ...	5.28	8.68	23.65	22.66
Gatooma ...	10 64	14.18	37.19	23.18
Gatooma Experiment Station	6.97	10.67	30.05	n.s.
Gowerlands ...	3.04	9.83	25-27	21.76
Handley Cross ...	2.85	9.21	21.82	n.s.
Hartley Gaol ...	6.52	10.86	27.14	22.57
Hopewell ...	4.39	5.99	22.29	23.30
Jenkinstown ...	4.40	8.28	24.88	22.71
Maida Vale ...	5.42	9.76	29.25	n.s.
Nyadgori ...	4.07	...	13.65	n.s.
Palham ...	2.38	6.61	19.77	23.58
Ranwick ...	11.49	9.34	20 83	22.50
Rocky Spruit ...	5.60	8.18	26.78	n.s.
Thornby ...	...	...	...	...
Thorndyke ...	4.02	6.19	15.38	n.s.
Lomagundi—				
Argyle ...	3.58	4.12	17.63	21.73
Baguta ...	11.19	...	...	...
Between Rivers ...	4.25	6.90	22.01	n.s.
Tsanunu ...	2.23	4.49	14.50	n.s.
Citrus Estate ...	2.58	5.62	20.78	20.64
Darwendale ...	3.60	5.67	19.19	21.42
Debera ...	...	...	...	...
Devonia ...	16.25	8.24	25.11	20.95
Dingley Dell ...	2.71	4.63	14.77	n.s.
Elinda ...	...	...	...	...
Gambuli ...	4.84	5.66	19 80	23.2[illegible]

RAINFALL—(*Continued*).

STATION.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi (continued)—				
Msina ...	3.28	5.72	19.61	n.s.
Impingi ...	6.28	4.74	23.20	n.s.
Kapiri ...	4.20	4.66	22.36	n.s.
Lone Cow Estate ...	1.88	3.43	18 23	21.96
Mafoota ...	3.81	5.05	19.21	n.s.
Maningwa ...	3.73	5.68	19.75	21.36
Mica Field ...	3.13	9.57	23.62	n.s.
Montrose ...	1.48	6.05	20 72	n.s.
Mpandegutu ...	4.82	7.97	24.02	n.s.
Mukwe River Ranch ...	5.12	5.87	21.18	20.09
North Banket ...	4.62	7.35	24.13	n.s.
Nyapi ...	4.59	6.91	24.39	n.s.
Nyarora ...	3.13	4.86	21.12	n.s.
Nyati ...	3.92	2.90	18.64	n.s.
Palm Tree Farm ...	2.57	9.28	23.13	21.32
Puri ...	2.59	...	18.43	n.s.
Raffingora ...	4.03	4.35	22.59	n.s.
Richmond ...	7.07	5.83	23.70	n.s.
Robbsdale ...	2.81	4.65	16.49	n.s.
Romsey ...	2.33	4.82	17.76	n.s.
Silater Estate ...	5.56	6.16	22.44	n.s.
Sinoia ...	3.06	7.04	24.46	21.50
Sinoia's Drift ...	4.09	4.10	17.55	n.s.
Sipolilo ...	6.32	...	24.18	21.40
Umboe ...	3.92	5.43	19.95	n.s.
Umvukwe Ranch ...	4.66	4.74	20.77	21.89
Woodleigh ...	4.38	6.38	23.18	n.s.
Yeanling ...	2.11	7.45	23.07	n.s.
Salisbury—				
Avondale (Broadlands) ...	3.48	4.62	19.01	22.31
Ballineety ...	2.90	5.95	18.69	n.s.
Botanical Experiment Station	1.74	3.10	14.93	21.89
Bromley ...	4.80	5.79	22.69	22.96
Cleveland Dam ...	4.82	4.19	23.37	21.81
Gwebi ...	3.51	5.74	19.92	22.51
Hillside ...	...	...	...	...
Lochinvar ...	4.64	2.98	15.71	20.56
Manor Farm ...	5.13	...	16 75	n.s.
Salisbury Agricultural Dept.	3.84	5.29	18 84	n.s.
Sebastopol ...	2.86	4.05	18.87	23.03
Selby ...	...	...	...	n.s.
Stapleford ...	5.78	1.81	18.89	23.73
Tobacco Experiment Station	3.67	...	16.44	n.s.
Western Commonage ...	3.80	3.48	17.80	23.25
Sebungwe—				
Sikombela ...	4.40	6.75	22.27	22.61
Wolverley ...	2.15	6.50	19.33	n.s.

RAINFALL—(*Continued*).

STATION.		1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE D.:					
Darwin—					
Cullinan's Ranch	...	5.92	6.77	21.82	n.s.
Fountains	...	3.91	8.53	15.12	n.s.
Mount Darwin	...	5.50	5.91	21.70	35.35
Rusambo	...	4.67	3.76	17.38	n.s.
Inyanga—					
Inyanga	...	2.69	4.33	20.00	43.43
Juliasdale	...	5.15	5.55	19.62	n.s.
Rhodes Estate	...	4.83	4.79	21.16	45.19
Makoni—					
Ardlamont	...	2.29	2.37	15.76	n.s.
Eagle's Nest	...	5.19	4.93	23.18	38.81
Mayo Ranch	...	...	...	5.49	n.s.
Nyogeni	...	1.89	3.05	12.08	n.s.
Kelvin	...	...	...	...	n.s.
Wensleydale	...	...	7.74	16.91	n.s.
Marandellas—					
Fault Farm	...	5.71	4.81	23.17	n.s.
Mazoe—					
Argyle Park	...	3.09	5.15	19.83	n.s.
Atherstone	...	5.91	8.55	22.03	n.s.
Bellevue	...	5.00	6.30	21.77	n.s.
Benridge	...	3.69	5.14	19.67	n.s.
Bindura	...	3.96	9.69	21.97	38.75
Ceres	...	7.97	8.01	24.07	41.65
Chipoli	...	5.15	...	15.90	37.06
Citrus Estate	...	3.96	5.72	21.32	37.61
Craigengower	...	3.51	6.82	20.92	36.29
Dandejena	...	4.51	5.48	19.02	n.s.
Donje	...	3.70	5.94	24.79	n.s.
Dundry	...	...	...	...	...
Frogmore	...	4.77	5.36	21.01	n.s.
Glen Divis	...	4.06	5.36	22.92	n.s.
Glen Grey	...	4.32	5.47	22.86	n.s.
Hinton	...	3.50	...	13.58	n.s.
Great B	...	3.41	8.70	23.11	n.s.
Kilmer	...	3.17	7.27	21.10	37.15
Kingston	...	6.15	8.28	23.59	41.60
Mazoe	...	5.33	5.31	18.70	37.89
Maienzi	...	5.29	3.58	16.93	n.s.
Marston	...	4.97	...	12.96	n.s.
Mgutu	...	4.50	3.74	21.77	n.s.
Muripfumba	...	2.62	6.98	19.74	n.s.
Omeath	...	5.80	6.50	26 79	36.58
Pearson Settlement	...	3.28	6.48	21.37	n.s.
Pembi Ranch	...	3.71	7.27	21.78	n.s.
Riversdale Estate	...	5.43	7.00	25.00	n.s.
Ruia	...	4.46	7.23	23.08	40.93
Horta	...	2.55	8.91	25.04	37.53
Rustington	...	5.78	5.09	20.09	n.s.
Shamva Mine	...	6.97	4.50	20.90	38.68

RAINFALL—(*Continued*).

STATION.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Stanley Kop ...	3.78	5.64	20.89	35.94
Sunnyside ...	5.13	8.89	28.54	38.11
Teign ...	2.54	7.56	20.38	n.s.
Usk ...	5.97	8.62	27.84	41.51
Vergenoeg ...	...	...	...	n.s.
Virginia ...	4.54	7.48	23.97	35.63
Visa ...	6.41	5.03	23.27	n.s.
Woodlands ...	6.43	9.76	24.37	38.12
Zombi ...	6.97	3.84	21.82	40.91
Mrewa—				
Maryland ...	5.25	3.69	19.94	38.73
Mrewa ...	8.74	4.08	23.70	40.48
Selous Nek ...	7.17	3.92	17.74	38.69
Mtoko—				
Makaha ...	3.18	4.73	18.94	36.54
Mtoko ...	6.09	3.72	22.11	32.14
Nyaderi Mission ...	5.27	2.90	20.82	n.s.
Salisbury—				
Arcturus ...	8.12	8.87	27.76	42.55
Calgary ...	4.31	5.46	19.85	n.s.
Chindamora Reserve ...	4.08	2.76	17.05	n.s.
Chinyika ...	4.76	...	17.36	n.s.
Glenara ...	3.80	3.08	18.19	36.31
Goromonzi ...	7.49	3 86	23.92	44.08
Hatcliffe ...	4.55	7.73	20 56	38.65
Hillside (Bromley) ...	4.10	5 02	24.88	n.s.
Kilmuir ...	7.86	4.47	24.55	n s.
Meadows ...	6.63	5.18	23.28	43.91
Pendennis ...	3.77	3.29	17.71	n.s.
Selby ...	3.71	4.26	18.49	36.07
Springs ...	6 78	3.11	17.51	n.s.
Teviotdale ...	5.26	5.23	10.49	n.s.
Vainona ...	3.85	4.76	18.95	38.39
ZONE E.:				
Belingwe—				
Belingwe (N.C.) ...	2.67	2.86	9.03	20.02
Doro ...	3.61	4.00	11.29	n.s.
Shabani ...	3.79	3.33	9.05	n.s.
Bikita—				
Angus Ranch ...	3.74	...	7.67	20.49
Bikita ...	4.46	6 99	17.32	n.s.
Devuli Ranch ...	3.44	4.31	7.75	n.s.
Charter—				
Buhera ...	4.47	7.64	25.45	29.74
Chibi—				
Chibi ...	3.69	...	9.03	19.95
Lundi ...	.66	4.52	10.46	18.23

RAINFALL—(*Continued*).

Station.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Chilimanzi—				
Alanberry ...	2.15	6.20	17.80	23.95
Driefontein ...	3.06	4.95	15.42	22.42
Felixburg ...	3.17	5.30	15.88	25.66
Grootfontein ...	5.62	4.62	16.27	24.75
Induna Farm ...	1.52	4.24	13.96	26.97
Mtao Forest ...	1.90	5.44	14.11	n.s.
Mukowries ...	1.83	6.30	16.60	n.s.
Requeza Estate ...	2.02	5.05	15.30	n.s.
Thornhill ...	2.26	5.10	14 00	n.s.
Gutu—				
Alheit Mission ...	1.88	5.01	12.16	19.86
Chindito ...	2.72	4.72	16.62	27.62
Eastdale Estate ...	1.95	7.53	19.41	27.10
Gutu ...	2.71	...	16.98	25.72
Glenary ...	2.79	5.84	19.96	22.08
Gwelo—				
Glencraig ...	3.67	6.24	17.31	n.s.
Partridge Farm ...	5 04	5.98	18.45	30.25
Sheep Run Farm ...	4.43	4.87	17.76	25.34
Inyanga—				
St. Trias' Hill ...	4.02	2.76	20.46	32.66
Insiza—				
Roodeheuvel ...	2.32	2.43	12.58	22.53
Makoni—				
Craigendoran ...	3.44	...	17.34	24.97
Forest Hill ...	3.71	4.94	18.92	26.35
Gorubi Springs ...	3.83	5.37	20.24	26.77
Inyagura ...	3.61	5.21	18.68	n.s.
Makoni Kop ...	3.62	4.16	19.78	n.s.
Mande ...	6.08	...	15.81	n.s.
Mona ...	3.91	3.56	16.27	29.76
Monte Cassino ...	4.62	3.54	24.85	29.41
Romsley ...	...	...	...	n.s.
Ruati ...	6.64	7.84	23.95	n.s.
Rusape ...	5.19	...	14.27	25.72
Tablelands ...	7.88	8.05	27.45	n.s.
Tsungwesi Ranch ...	7.51	...	18.92	n.s.
Springs ...	3.47	4.32	24.72	26.51
Whitgift ...	3.64	6.53	19.61	n.s.
Marandellas—				
Benongwe ...	4.24	5.92	20.52	27.39
Delta ...	4.06	4.48	16.19	27.14
Elandslaagte ...	2.09	5.54	18.30	n.s.
Marandellas Estate ...	1.85	5.42	17.58	27.32
Lendy Estates ...	6.15	2.23	20.53	29.26
Lushington ...	4.19	2.94	15.59	n.s.
Macheke ...	4.70	3.14	19.23	29.86
Marandellas ...	4.75	5.87	23.37	31.09
Nelson ...	2.44	7.04	22.74	24.02
Tweedjan ...	3.03	5.29	21.53	29.17
Wenimbi ...	6.00	2.20	21.89	n.s.

RAINFALL—*(Continued)*.

Station.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(continued)				
Melsetter—				
Brackenbury ...	6.70	5.73	22.46	45.25
New Year's Gift ...	2.56	6.35	16.35	n.s.
Ndanga—				
Doornfontein ...	3.70	5.16	15.39	22.26
Manjirenji ...	...	...	7.44	n.s.
Marah Ranch ...	4.35	4.83	16.99	26.52
Zaka ...	2.22	6.52	18.84	32.66
Selukwe—				
Aberfoyle Ranch ...	2.26	4.30	13.45	26.53
Danga ...	...	...	.38	n.s.
Hillingdon ...	3.22	7.04	20.36	26.71
Impali Source ...	1.40	6.15	15.95	n.s.
Rio ...	3.45	5.51	18.51	25.03
Safago ...	3.25	7.09	20.10	27.57
Selukwe Gaol ...	2.27	7.81	15.84	n.s.
Tokwe Block ...	3.33	4.13	14.14	n.s.
Woodlands ...	5.10	5.57	17.92	n.s.
Umtali—				
Alicevale ...	4.60	...	14.11	26.59
Argyll ...	4.96	4.03	16.70	26.46
Embeza ...	6.01	10.14	37.75	n.s.
Fairview ...	3.09	6.73	20.55	n.s.
Fern Valley ...	3.37	7.25	19.80	n.s.
Jerain ...	1.26	3.28	12.76	27.10
Mutambara Mission ...	2.08	4.53	18.00	24.98
Odzani Power Station ...	3.65	6.89	23.88	30.75
Park Farm ...	4.67	6.15	24.41	n.s.
Premier Estate ...	2.75	6.33	17.84	25.93
Sarum ...	4.97	4.00	16.16	24.01
Stapleford ...	5.89	...	27.92	60.36
St. Augustine's Mission ...	3.93	24.34	41.19	n.s.
Transsau Estate ...	6.69	...	14.97	n.s.
Umtali Gaol ...	3.45	7.61	19.65	27.69
Victoria—				
Brucehame ...	3.10	3.71	14.77	23.51
Cambria ...	2.38	3.75	12.46	n.s.
Cheveden ...	4.46	7.91	20.28	n.s.
Clipsham ...	1.67	3.44	10.20	23.99
Gokomere ...	1.94	4.85	12.02	24.36
Mashaba ...	2.71	5.72	14.15	n.s.
Miltonia ...	3.20	3 64	12.65	n.s.
M'Sali ...	1.79	5.68	12.58	n.s.
Riverdene North ...	2.08	5.49	13.22	24.77
Salemore ...	3.29	5.39	15.90	n.s.
Silver Oaks ...	4.12	3.56	15.25	24.03
Stanmore ...	1.26	5.72	12.51	n.s.
Victoria ...	3.44	3.08	12.77	22.23
Zimbabwe ...	3.43	5.45	18.18	n.s.

RAINFALL—(*Continued*).

Station.	1927. Jan.	1927. Feb.	Total to end of period.	Normal rainfall to end of period.
Zone F.:				
Melsetter—				
Chikore ...	3.98	6.08	23.02	32.05
Chipinga ...	3.21	...	...	33.17
Lettie Swan ...	5.96	4.10	24 85	n.s.
Melsetter ...	8.09	...	22.89	35.14
Mount Selinda ...	6.93	9.08	31.53	46.61
Springvale ...	...	...	...	n.s.
Tom's Hope, East ...	4.01	12.21	18.06	37.60
Vermont ...	9.95	...	29.45	48.04
Umtali—				
Chimeze ...	5.08	9.10	33.87	n.s.
Hoboken ...	...	...	...	n.s.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	April	May
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	9	14
Banket Junction	Banket Hotel	F. Potts	1	6
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	28	26
Bindura	Bindura Farmers' Hall	W. E. Fricker	9	14
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	6	18
Bubi	Queen's Mine	E. C. Gaudin	12	10
Chakari	Various farms	L. T. Tracey	21	19
Chatsworth	Makowries Farm	A. W. White	2	7
Daisyfield	Daisyfield (April), Somabula (May)	L. E. Edwards	16	14
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	9	14
Enterprise	Farmers' Hall	John Johnstone	4	2
Essexvale	Essexvale	C. Geneve	17	15
Felixburg—Gutu	Trafalgar (April), Gungwe (May)	C. L. Burrows	9	14
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	5	3
Gadzema	Gadzema	G. M. Leahy	10	8
Gatooma	Speck's Hotel	C. M. Davenport	16	21
Gazaland	Court House, Chipinga	D. M. Stanley	4	2
Greystone	Quarrie Farm	P. J. van der Walt	...	14
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	14	12
Inyazura	Inyazura	Major Tulloch	1	...
Lalapansi	Lalapansi	Edmund Chapman	9	14
Lomagundi	Sinoia	F. W. Robertson	8	...
Lomagundi West	Various farms	E. Morton	17	15
Macheke	Macheke	M. J. Palmer	...	14
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	3	1
Makwiro	Makwiro	F. H. Howard	15	20
Makoni	Rusape	—. Munch	9	14

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	1	6
Marandellas, Southern	Various farms	D. J. Gale	6	4
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	8	13
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	14	12
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	16	21
Mazoe (Concession)	Concession Hotel	Frank Allen	12	10
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	13	11
Melsetter	Court House, Melsetter	Dr. Rose	14	12
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	13	11
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	30	28
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	1	6
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	2	7
Poorte Valley	Various places	D. Wilson	16	21
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	16	21
Salisbury South	Various farms	P. Linton	27	25
Selukwe	The Hotel, Selukwe	W. T. Simpson	1	6
Shamva	Shamva Hotel	E. Butler	21	19
Two Rivers Farming Association	Various farms	W. L. Parsons	9	14
Umboe (Branch of Lomagundi F.A.)	Various farms	A. J. Hawkes	...	14
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	16	14
Umtali	Drill Hall, Umtali	A. Howat	7	5
Umvuma and District	Umvuma	H. B. Colling	Not	received
Victoria	Victoria	H. Payne	8	13
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	13	11
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Imokilly Fern ...	Shorthorn	3,599.25	...	162	J. Bazeley, Heany Junc.
Daisy ...	do	2,699.00	...	142	do do
B. Duchess ...	do	3,187.25	...	125	do do
B. Emma ...	do	1,246.25	...	70	do do
Eileen Dairymaid	do	633.50	...	28	do do
B. Busie ...	do	1,022.50	...	49	do do
Roodebloem Starlight	Friesland	958.00	...	30	E. Buckley, Lalapanzi
Aanvang Foekje II.	do	1,537.00	...	30	do do
Sally ...	Shorthorn	4,517.10	221.76	378	G. Cooper, Essexvale
Banje ...	do	5,166.70	215.24	420	do do
Suzannah ...	do	4,263.70	164.75	273	do do
Zazkins ...	do	3,631.20	148.22	239	do do
Endor ...	do	3,185.30	111.85	236	do do
Key ...	do	2,631.90	93.36	206	do do
Mary ...	do	3,102.10	123.69	216	do do
Mooi ...	do	2,860.80	103.42	212	do do
Rosey ...	do	2,967.50	94.67	214	do do
Betta ...	do	2,110.50	86.82	127	do do
Flora ...	do	1,531.10	46.84	87	do do
Pepper ...	do	920.70	45.48	51	do do
Bella ...	do	837.90	28.82	48	do do
D.G. Sophie ...	Friesland	13,780.00	445.70	300	G. M. Cowen, Salisbury
Rosebud ...	Red Poll	4,360.00	...	203	M. C. Myers, S. Marandellas
Daisy ...	do	4,554.00	...	203	do do
Rambler ...	do	3,897.00	...	182	do do
Carnation ...	Friesland	6,934.25	...	467	R. Philip, Arcturus
Alyssum ...	do	7,990.25	...	441	do do
Buttercup ...	do	6,825.10	...	442	do do
Daffodil ...	do	5,997.25	...	436	do do
Poppy ...	do	1,735.75	...	60	do do
Iolanthe ...	do	5,026 00	156.50	308	R. R. Sharp, Redbank
Patience ...	do	4,354.00	161.20	259	do do
Phœbe ...	do	4,536.00	152.30	272	do do
Buttercup ...	do	5,103.00	170.20	182	do do
Anemone ...	do	4,425.00	151.10	210	do do
Zoe ...	do	4,711.00	144.70	175	do do
Pam ...	do	3,066.00	98.40	140	do do
Katisha ...	do	3,297.00	105.30	133	do do
Primrose ...	do	2,702.00	102.50	104	do do
Lady Jane ...	do	2,675.00	96.40	92	do do
Tessa ...	do	847.00	24.60	35	do do
Bessie ...	do	6,093.50	...	385	Swan Bros., Gwelo
Jess ...	do	6,780.50	...	378	do do
Nellie ...	do	5,603.50	...	357	do do
Jean ...	do	6,489.00	...	350	do do

RHODESIAN MILK RECORDS (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.	
Blossom ...	Friesland	3,111.50	...	126	Swan Bros., Gwelo	
Tiny ...	do	1,937.00	...	105	do	do
Grace ...	do	2,338.00	...	91	do	do
Tess ...	do	2,215.50	...	91	do	do
Mollie ...	do	1,774.50	...	84	do	do
Queen ...	do	829.50	...	35	do	do
Daisy ...	do	399.00	...	14	do	do
Harlen's Query	do	10,593.25	393.54	300	W. R. Waller, Salisbury	
Harlen's Kransje	do	6,518.00	204.22	270	do	do
Harlen's Primrose	do	4,847.00	178.69	240	do	do
Harlen's Model	do	8,439.25	266.26	240	do	do
MelroseFrederika	do	4,970.25	190.70	180	do	do
Wolseley Josephine	do	5,215.50	195.27	210	do	do
Dunoran Nona	do	6,143.50	196.69	150	do	do
Dunoran Pear	do	4,626.25	154.09	120	do	do
H.H. Iris ...	do	2,544.00	84.70	120	do	do
Harlen's Dainty	do	4,895.25	163.32	120	do	do
Bodlonfa Elsina	do	5,893.75	213.23	150	do	do
Harlen's Quest	do	1,507.00	56 51	60	do	do
D.G. Steinser ...	do	5,322.00	168.35	151	Gwebi Experiment Farm	
D.G. Froukje ...	do	5,484.00	155.48	137	do	do
D.G. Selma ...	do	4,930.75	148.07	123	do	do
D.G. Rosa ...	do	3,783.00	102.39	168	do	do
D.G. De Hoek ...	do	1,922.75	43.54	62	do	do
D.G. De Hoop ...	do	2,769.50	85.95	81	do	do
D.G. Bessie Burger	do	2,917.50	87.37	70	do	do
Kleinbloem ...	do	7,103.50	237.16	338	do	do
Clara ...	do	8,060.75	311.09	398	do	do
Waterbloem ...	do	9,469.00	325.69	435	do	do
P.T. Allie ...	do	4,812.00	142.55	123	do	do
Bertha ...	do	1,972.00	64.92	73	do	do
Fanny ...	do	7,637.25	258.75	275	do	do
Katie ...	do	6,594.50	209.57	260	do	do
Janie ...	do	6,667.50	238.93	267	do	do
Dorothea ...	do	7,684.50	277.89	344	do	do
Mooibloem ...	do	8,142.25	279.37	356	do	do
Lucy ...	do	7,800.25	205.18	259	do	do
Gladys ...	do	7,086.00	220.15	328	do	do
Antbloem ...	do	1,105.00	37.13	42	do	do
Isa ...	do	8,284.50	248.98	275	do	do
Elsie ...	do	10,719.25	361.62	352	do	do

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	..	...	1,713	...	...	101	...	...	1,965
February ..	77	...	...	695	...	...	112	.	...	884
March ...										
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

April.

BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

CROPS.

The rains are usually practically over by this month, and the harvesting of all crops will be in full swing. Veld hay may still be cut, although that mown towards the end of the month or later is usually fit for little better than litter. The filling of silo pits and stooking of maize will continue, and where Napier fodder has been used for the purpose, there should be a considerable after-growth to serve as winter pasture. When the maize stooks have been set up in parallel lines across the field the land can, with great advantage, at once be ploughed between the lines. Vlei and irrigable lands for winter crops should now be ready, and late varieties of cereals, such as Algerian oats, or barley and rye for green fodder, can be sown. Onions sown earlier for the winter crop can now be transplanted to their permanent positions. The ploughing under of all green manuring crops should be completed early this month while the soil is still sufficiently moist to effect rapid decomposition. Ploughing in preparation for next year's crops should continue wherever possible. From now onwards, as opportunity offers, planters, drills, etc., should be cleaned up, greased and painted preparatory to being put away until the following season.

DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud and manure which has accumu-

lated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time; the shed need not be elaborate, but should have a watertight roof and an impervious and easily cleaned floor. If it is impossible to erect a milking shed, the cattle should be milked in a new kraal, clean and free from dust, flies, etc. Every effort should be made to keep the cows clean. The udders should be wiped before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking, as detailed in the Dairy Act. Cream should be cooled as rapidly as possible, after separating, and should be kept cool and stirred at least twice a day until ready for despatch to the creamery.

If butter is made, the cream and washing water should be put out overnight. By this means the temperature of both the cream and wash water can be reduced to about 60° F., and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter. It may be necessary, after very cold nights, to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95° F., stir the cream frequently and replace the water when cold. The churning temperature is of extreme importance in butter making, and it is essential that a dairy thermometer be always used to ascertain the temperature of the cream, wash water, etc.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard dry cheese will result. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours. The starter should have a clean, sour taste and smell.

This is usually a critical period of the year for the dairy cow. The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt.

Cotton.—Damage to bolls from bollworms may be betrayed by the dropping of the bolls attacked. These should be collected and burnt. Cotton stainers should be destroyed by hand collecting. Guinea fowl, turkeys, etc., may be encouraged about the land to destroy stainers and other insects.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas. Soft brown scale may be controlled by spraying with resin wash. If unseasonable young growth appears, aphis may develop and must be kept suppressed to prevent soiling of the fruit with black fungus.

Vegetable Garden.—Plants of the cabbage family are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water. Bagrada bug is difficult to fight, but carbolic emulsion and resin wash have been recommended as sprays elsewhere. These washes must be applied directly to the insects, and the immature stages are more readily killed than the adults.

Potatoes should be cultivated systematically and hilled to keep the tuber moth from the tubers.

FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable, and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken up, divided and replanted this month. Plant out from seed beds cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any strong undesirable branch growth may be checked by breaking off the leading shoot.

POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have

plenty of fresh warm air, but are not exposed to draughts. After 48 hours give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

Eggs have become scarce, and it is to be feared will become still scarcer this month. The chief reason for this is lack of proper attention to the birds and a little different treatment to that usually given at other seasons of the year. A pamphlet on causes of and remedies for this scarcity can be obtained gratis from the Poultry Experts.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 423. The Common Sunflower, by C. Mainwaring.
No. 428. The Sweet Potato, by J. A. T. Walters, B.A.
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No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.

No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.

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No. 557. Selection of Virgin Land for Arable Farming, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

No. 560. Climatic Conditions and Cotton Growing in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

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No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 601. Maize for Export, by S. D. Timson.

No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.

No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

No. 634. Barley, by P. V. Samuels.

Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

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No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

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No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

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No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.

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TOBACCO.

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No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.

No. 623. Report on Experiments at the Tobacco Experiment Station, Salisbury, Seasons 1924-25 and 1925-26, by A. C. Newton, B.Sc.

No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

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No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

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No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
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LIVE STOCK.

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No. 392. Memorandum on the Cattle Industry of Southern Rhodesia, 1921.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
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No. 624. The Construction of Dipping Tanks for Cattle (Revised).
Arsenite Cattle Dip—How to Mix.

DAIRYING.

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No. 604. Farm Butter Making, by T. Hamilton, M.A., N.D.D., N.D.A., Dairy Expert.
No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.
No. 612. Production of First-Grade Cream, by J. R. Corry, B.Sc.
Drawings of cow byres can be obtained upon application to the Dairy Expert, Department of Agriculture, Salisbury.

VETERINARY.

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Cold Weather: Treatment of Fowls in, by A. Little, Poultry Expert.
Tuberculosis, by A. Little, Poultry Expert.
Diseases of the Liver, by A. Little, Poultry Expert.
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The Moult, by H. G. Wheeldon, Assistant Poultry Expert.
Selecting Birds for Laying Tests (concluded), by A. Little, Poultry Expert.
The Normal and Pullet Moult, by H. G. Wheeldon, Assistant Poultry Expert.
Culling: A Seasonal Operation, by A. Little, Poultry Expert.

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No. 358. Notes on the Regulations Governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.

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No. 609. Protection from Lightning, by Lieut.-Col. Judson.

The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Farming Returns for Income Tax Purposes.
Land Bank Act (price 1/-).
Twelve Simple Rules for the Avoidance of Malaria and Blackwater.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	GAME LAW CONSOLIDATION ORDINANCE, 1906.
11.3.27.	Government Notice No. 330 of 1914 is cancelled and the following is no longer an open shooting area:— Description of Area. Any portion of Hartley district lying to the west of a line drawn directly from the junction of the Umfuli and Yabongwe Rivers to the most northern beacon of Rhodesian Plantations; thence along the western boundary of the Rhodesian Plantations to the north-east beacon of Carfax Estate; thence along the northern and western boundaries of Carfax Estate; thence in a direct line from the south-western beacon of Carfax Estate to the north-west corner beacon of farm No. 7; thence along the western boundary of that farm to the Mzoe River; thence along that river to its junction with the Umsweswe; thence along the Umsweswe River to its junction with the Umniati. (G.N. No. 149.)

Silver Stream Waterfall on farm Ceciltown, Melsetter district.

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.

Noxious Weeds.—We publish in this issue of the Journal an article by the Botanist outlining the main provisions of the Noxious Weed Act, which was passed at the last session of the Legislative Assembly, and describing in detail the weeds scheduled under the Act. Drawings of the various noxious weeds are also reproduced, and it should thus be a simple matter for anyone to identify the plants in question. The Act comes into force on a date to be proclaimed in the *Gazette* by the Governor-in-Council, and we understand that this date will shortly be announced. The weeds scheduled in the Act are burweed, Mexican poppy, dodder and prickly

pear (three species), and it will be seen that farmers have very clear responsibilities in the matter of clearing their lands of these weeds. The Act, *inter alia,* authorises the Governor-in-Council to add to or remove any plant from the list of declared noxious weeds. It behoves all farmers and occupiers of land to become acquainted with the provisions of the Act.

Co-operation and Agriculture.—So much has been written in the last few years on the subject of co-operation and agriculture that we hesitate to add to the mass of matter which farmers and those associated with the agricultural industry are called upon to digest. There is, however, such peculiar aptness about the remarks made by the President in his address to the ninth Conference of Registrars of Co-operative Societies held in Bombay in 1926 that we feel justified in quoting a few extracts. The President, *inter alia,* emphasised the fact "that the greatest enemies of the co-operative movement to-day are those of our friends who wish to force the pace, to rush on to quick results, and to advance without consolidating our gains." This statement serves to remind us of the numerous failures recorded against the co-operative movement owing to premature and precipitate action. Again, "one of the greatest and most urgent problems—by no means peculiar to India—is the discovery and training of suitable leaders." Referring to the necessity for organising the people, the President stated: "It is recognised, in India at least, that the State alone cannot solve so vast a problem; the people must be taught to help themselves and to help each other. In other words, there must be active co-operation among the members. . . ." In concluding his remarks, the President said, "the panacea for poverty is fifty years of hard work, hard study, hard saving and hard living."

Statistics.—Readers will probably have noticed that certain prosecutions have recently been instituted under the Agricultural Statistics Ordinance. These proceedings have not been taken without much thought and only after all other means of obtaining the returns have been exhausted. They

are certainly not directed against individuals, but are intended to draw attention to the necessity for all farmers to render their returns promptly. The statistics compiled from the returns are becoming more important every year, and enquiries are increasingly being made for information as to various crops by merchants and others not only in this Colony, but also abroad. Apart from their value to the Government, the railways and other institutions in this Colony, the statistics will indirectly, if not directly, help farmers, for buyers can see what crops are available and to what portions of the Colony to look for them. Owing to the difficulty of getting the returns in, results are not available for publication until five months after the returns are due, for although two-thirds of the returns may be received within a month or six weeks of the due date, publication of the figures is delayed owing to the difficulty experienced in collecting the other third. Unless statistics are complete, they are not only useless but misleading, while late publication of the figures very materially affects their value. It is essential, in the interests of the farming community, that every farmer should make it his special duty to furnish the required information as soon as it becomes due. If by any chance the necessary forms do not come to hand, the Statistician, Department of Agriculture, should immediately be communicated with.

Details of summer crops, orchards, etc., are due on the 15th September in each year, and details of live stock, dairy products, labour employed and an estimate of the acreage planted to summer crops on the 31st December in each year. These returns are required from all farmers or agricultural plot owners as well as from persons grazing cattle on town lands.

Vlei Land Tobacco.—The photograph reproduced herewith is of a crop of tobacco grown by Mr. C. R. Deary of Wychwood East, Bromley. The point of interest is that the tobacco was planted as an experiment on vlei land, the plants being put out into the field from 16th September onwards for about a month. Mr. Deary states that the earlier planted tobacco grew better than the later. A good crop, however,

was reaped, though the leaf was on the heavy side and in the curing sponged very easily, due presumably to there being an excess of moisture in the leaf. Mr. Deary considers that the experiment has proved its possibilities, and he intends to plant 25 acres of such tobacco next season.

Vlei land tobacco grown at Mr. C. Deary's farm, Wychwood East, Bromley.

It is understood that the vlei referred to is of a sandy nature, and is not the typical heavy black vlei soil. Further, the tobacco was, we understand, planted on those portions of the vlei which have some natural drainage, and not on the water-logged sections. In a normal year tobacco planted in September could be reaped before the heavy rains set in.

Tobacco.—A report has reached us of an experiment which was made last year to grow Rhodesian Hickory Pryor tobacco in Dorsetshire, England. No particulars are given of the acreage planted or the yield obtained, but the tobacco factory which reported on the leaf stated that it was the nearest thing to the Virginia type they had received from a grower in England. The tobacco was said to be strong and full bodied, and the factory were willing to pay 3s. per lb. for it.

Estimates so far received by the Department of Agriculture show that over 30,000 acres were planted with tobacco last season. As the weather conditions in the main tobacco growing areas were on the whole favourable, a crop of from 12,000,000 lbs. to 15,000,000 lbs. may be expected, a large proportion of which will be bright leaf.

It is pleasing to record the fact that quite a number of new growers, many of them new to the country, have made a success with their first crop, and should reap a handsome profit. Some growers, however, perpetrated the old error of harvesting the leaf too green, with the result that it has been impossible to eradicate the undesirable colour in the curing process. A large proportion of the leaf this year is heavy bodied and contains a good deal of moisture. Such tobacco requires special regulation of the temperature in the barn to prevent "sponging," which unfortunately has been in evidence at a number of farms. Experience will remedy these errors.

There are numerous instances of growers who have planted larger areas than they can properly handle, with the result that the quality of the leaf has suffered, while a good deal of the tobacco has been wasted. The futility of this practice must be obvious to growers. The matter of grading has been freely discussed lately, some holding the opinion that grading at central warehouses is preferable to farm grading and others holding the reverse opinion. We do not intend to enter into a discussion of the merits of this controversy, but would draw attention to the article which appears in this issue of the Journal by the Tobacco Expert explaining the process of grading on the farm. The article also deals with conditioning and baling the leaf, and is a valuable addition to the literature which this Department has available for distribution on the subject of tobacco growing in the Colony.

Rhodesian Citrus Fruit in India.—In the December issue of this Journal we mentioned the fact that an exhibit of choice Rhodesian Valentia Late oranges had been awarded a medal and a certificate at the Poona Agricultural Show in October. This fruit, which was part of a consignment of

100 cases, was sold at an average price of 34s. per case, the remainder realising about 24s. per case. With commendable enterprise the Rhodesian Co-operative Fruit Growers' Association, Ltd., is following up this success by booking shipping space for other consignments to be despatched to India during the coming season. The first shipment of 200 cases of oranges was due to leave at the end of April, and two other consignments of a similar size are to follow later on. There is reason for believing that Rhodesian oranges sent at this time of the year will sell well in India, and this attempt to test the market on a bigger scale will be watched with interest.

The general export overseas of Rhodesian citrus fruit commences this month, and we gather that something approaching 150,000 cases may be railed during the season. The great bulk of this will travel *via* Capetown, although a fair amount of space has been booked on ships calling at Beira. The crop this year is a very heavy one, and the early fruit has the appearance of being of excellent quality, although a rather high percentage of the Washington Navels has thick skins. Exporters will therefore have to be careful in packing their fruit, for, according to the regulations in force last year, cases containing more than 5 per cent. of thick-skinned fruit are subject to rejection.

The competition which South African oranges meet at this time of the year from Spanish fruit is not likely to be so keen as usual, on account of the short crop in Spain, and early consignments may therefore realise good prices. The energetic campaign which the Empire Marketing Board is carrying on to popularise Empire fruit will, we hope, be extended to citrus, in which event the consumptive demand in the United Kingdom is likely to increase considerably. The Dominions and Colonies are under a deep debt of obligation to the Imperial Government for the action which they have taken to increase the demand for Empire products. So long as we send fruit of good quality, suitably packed and graded according to the requirements of the Home market, there is likely to be a ready sale at remunerative prices.

We gather from the *S.A. Fruit Exporter* that citrus growers in California received an f.o.b. return of £19,604,606 for their fruit last year, or about £1,000,000 more than the previous year. This high return was secured in spite of the

fact that the crop was the largest in the history of the industry, and that citrus fruit marketing faced competition of a serious over-production of other fruits. This result could only be achieved by efficient marketing organisation, and is a shining example of well directed co-operative effort.

The Poultry Industry.—It is pleasing to record the fact that the Young Bird Poultry Show held in Salisbury on the 26th March, under the auspices of the Salisbury and District Poultry Club, was a distinct success. Several of the entries, which numbered nearly 300, were of outstanding merit, while the standard of quality generally was of a high order and sufficient to convince one that there is no need to go outside the Colony for breeding stock. The poultry industry has made striking progress during the past few years, but there is still room for expansion and improvement, and we feel that shows of this nature serve an admirable purpose in helping towards this end. The shows are held early in the year for the express purpose of enabling breeders to select their birds for the mating season. Most of the birds exhibited are offered for sale, and an unique opportunity is thus afforded buyers of securing birds whose merits have been duly assessed. Exhibitors obtain a good advertisement of the type of bird they are breeding, and altogether the shows serve a very useful purpose and are deserving of every encouragement. We commend the idea to other centres.

We regret to learn that the support accorded the various poultry clubs in the Colony is languishing, and that others, after a brief existence, have ceased to function. This is greatly to be deplored, for these clubs, by fostering interest in poultry matters and by encouraging the adoption of up-to-date methods, are able to accomplish much. A most important point in the successful functioning of these poultry clubs is the selection of the right men to conduct the affairs of the clubs. This is a matter entirely within the control of members, whose business it is to see that they are represented by the right men.

In spite of all that has been said and written on the

subject, we still have a period of egg scarcity in the Colony, a period which coincides with the wet season of the year. The Poultry Experts assure us that there is no need for this scarcity, and that eggs can be produced at any time of the year by the adoption of the right methods. This is a matter which the poultry clubs can well take up. Stated briefly, the remedy is said to lie in early hatching, correct treatment of the birds during the moult and proper methods of housing and feeding. A proof of this is given in the results obtained at the egg laying tests.

We have it on the best authority that Rhodesia is peculiarly favoured for the rearing of poultry. There is undoubtedly an opportunity for establishing a very large and profitable industry in the Colony, not only in the export of eggs to the territories to the north of us, where there is a large and expanding market, but in increasing the consumption of eggs in the Colony. The poultry clubs can do much in this direction also.

The Handling, Grading and Baling of Cured Virginia Tobacco.

By D. D. BROWN, Tobacco and Cotton Expert.

Tobacco requires careful attention right up to the time it is sold, and growers should not fail to bestow the required care until the crop has been delivered to the warehouse. A common failing is the neglect of the crop after it is cured; heavy financial losses to tobacco growers are a direct result of carelessness in this respect.

The following notes are intended primarily for the assistance of those growers producing a tobacco crop for the first time.

Conditioning.—After the tobacco in the barn is cured the leaf is extremely brittle and cannot be removed without serious damage unless it be conditioned and made soft and pliable before being handled. Tobacco becomes soft when exposed to damp atmospheric conditions; these conditions may be brought about by the use of water, steam or a combination of both in the curing barn. A conditioning pit may also be used.

When bringing tobacco into condition through the combined agency of water and the natural moisture of the atmosphere, the barn should be kept well wetted by sprinkling water on the floor and the walls below the bottom tier. The doors and ventilators should be kept open over-night and closed during the day, except on dull misty days, when they should be left open to allow the moist air to enter the barn.

Conditioning tobacco by means of filling the barn by steam is generally found to be more expeditious than the above method. The use of a steam outfit makes it possible to condition the tobacco at all times and renders the grower more independent of weather conditions.

The general practice is to have a large steam boiler (about 10 to 12 h.p.) placed conveniently to the flue curing barns and grading shed. Steam pipes are led from the boiler to the barns and another connection to the steaming boxes in the grading shed. From the main pipe line running along the front of the barns a connection is led to the centre of the floor of each barn, where a right angle bend is fixed and a short length of pipe fitted. Over each of these short outlet pipes an old plough disc or similar object to make a spreader is placed about 12 inches above the end of the pipe; this prevents a jet of steam being blown up into the tobacco and causes a better distribution of steam over the whole area of the barn floor.

When conditioning tobacco by steam, the door and ventilators are closed after the barn has been cooled down and the steam turned on. If the weather is very dry it may be necessary to pour water on the floor and lower portions of the walls of the barn in order to help to saturate the atmosphere within the barn.

The tobacco on the sticks hung on the lower tiers will come into condition first; these sticks should be removed as soon as the tobacco is soft enough. This will prevent the tobacco on the lower tiers from damage through becoming too moist, and will also make room for the steam to rise to the upper tiers. To be fully effective steam must be moist; superheated or dry steam is useless. The boiler should therefore be kept at a low pressure.

Tobacco can also be brought into condition by being placed in a conditioning pit; this is the most desirable means of conditioning the leaf. The barn should be left open overnight and the floor and lower walls wetted. Next morning the tobacco should be ready for removal from the barn, and should then be hung up in the conditioning pit until the proper amount of moisture has been absorbed by the leaf. Should climatic conditions be such that one night in the curing barn with open door and ventilators is sufficient to bring the tobacco into proper condition, it will not be necessary to use the pit. When necessary, steam can also be used to make the tobacco just soft enough to handle without breakage, and the conditioning process can be completed in a conditioning pit.

When both a steam boiler and a conditioning cellar are available it may be a good plan first to steam the tobacco until it can be safely removed from the barn; the sticks are then hung up in the conditioning pit until the leaf is in proper condition for bulking.

Cured tobacco is a perishable product and requires proper handling if serious damage is to be avoided. This is especially true in the conditioning of the leaf. Excessive moisture will darken the colour and cause depreciation in the value of tobacco, especially in the case of bright leaf.

The correct condition for the leaf to be in for bulking is indicated when the web of the leaf and the lower half of the mid-rib are pliable and the upper half of the mid-rib is only slightly supple. The characteristics of the cured leaf are either improved or damaged in the process of bulking irrespective of the method by which it was cured. If reasonable care and attention are given, the leaf improves in the bulk. When bulked too dry, the necessary changes cannot take place in the leaf and the quality of tobacco suffers. The leaf also breaks up and causes a lot of scrap. If bulked in high condition, the leaf will quickly begin to ferment and go mouldy.

Bulking.—The bulking shed should have a watertight roof, as any water falling on the bulks will cause damage to the tobacco; the floor should also be dry and the walls weatherproof. A strong light is detrimental and will bleach the leaf; only sufficient lighting to give good visibility is all that is required in a bulking shed. Ventilation should also be provided for. Inside the building beds or platforms are placed and so aligned that there is easy access to both sides and ends of the tobacco bulks. These platforms are made by placing boards or poles very closely together on cross members supported on brick pillars, which are built up high enough to leave an air space of about 12 inches between the floor and the underside of the bed. On most farms, where the only available material for construction of these platforms is rough timber which would damage the first layer of leaf, it is essential to place reed mats or hessian on top of the beds before bulking down any tobacco.

Tobacco bulks may be built either with a circular or

rectangular base, the latter being the most economical as regards floor space. When the tobacco is in condition as previously described, it is untied from the sticks and roughly graded into four grades, viz., bright, medium, dark and green. Each of these grades should then be bulked separately. Leaf which is harvested ripe but remains green in colour should be placed in one corner of the shed, as this bulk is the last one required for grading. The grading and baling of the bright leaf is recommended to be carried out first, because this type of leaf may lose colour and depreciate in value when kept under unfavourable conditions. If baled and kept in proper condition, no loss in colour is likely to take place. Baling of the other grades should be done as soon after curing as possible. The medium leaf is next graded and baled, then the darker grades. The bright and medium bulks should be placed in the most accessible part of the bulking shed.

It sometimes happens that some of the mid-ribs are not properly dried out in the curing. These mid-ribs or "fatty" stems contain much moisture, and if placed in the bulk will cause the tobacco to mould. When unstringing, a careful lookout must be kept and all leaf with "fatty" stems put on one side, and after being re-strung should be hung up to dry out thoroughly. The sticks may be placed in a barn in which tobacco is being dried out, say, when the temperature is about 140° F. to 150° F., and left there until the temperature has been increased to 160° F. The barn should then be cooled down and the tobacco conditioned.

The bulks can be made any suitable length, and should be at least 6 feet wide and about 6 or 7 feet high. When placed in very small bulks the tobacco does not have much chance of improving in quality, as the leaf tends to dry out too quickly.

When making a bulk of tobacco the butts of the leaf must be placed to the outside and the tails face towards the inside. The tobacco is placed in position a handful at a time, and the outer edge, forming the sides and ends of the bulk, should be completed first. After this is done a second layer of leaf is placed with the butts about four inches in from the butts of the tobacco forming the first layer. This forms a bond and keeps the outside of the bulk from being

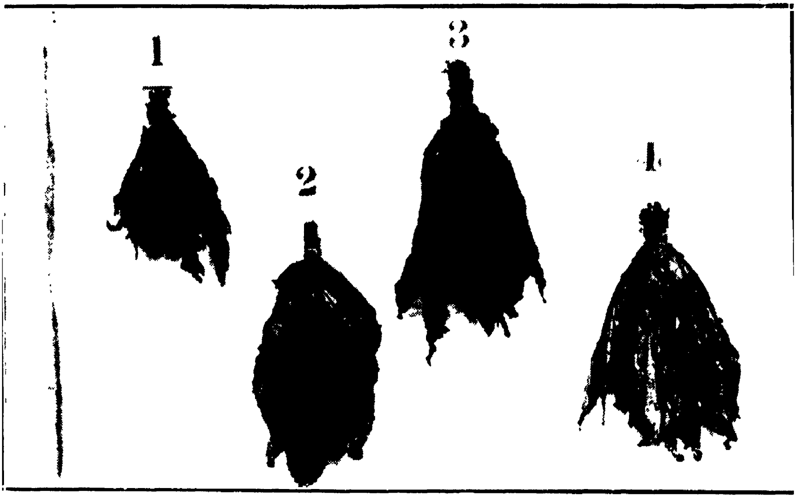


Plate No. 1.

A few of the common errors in tying the hands and the correct method.

No. 1. Leaf too short and broken to tie.

No. 2. "Pastelled" leaf (leaf flattened out before tying), which is more liable to damage and mould.

No. 3. Hand tied too far down the butt.

No. 4. Butts very uneven and exposed, extremely untidy and makes a bad bale.

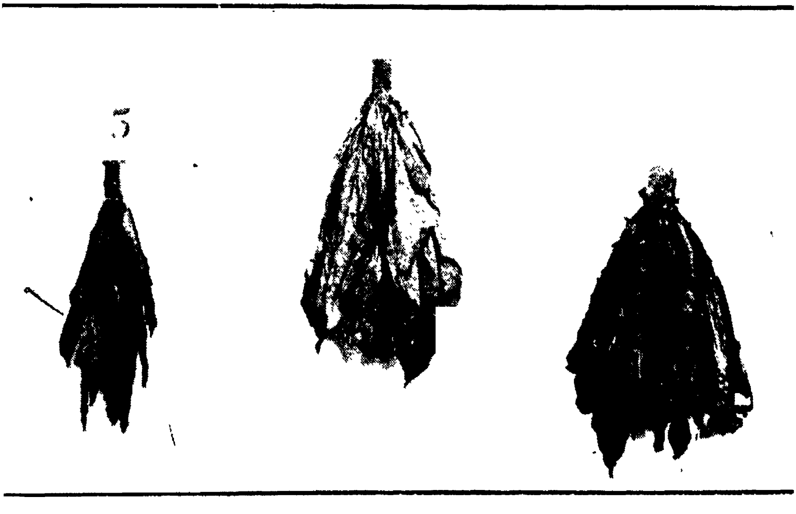


Plate No. 2.

No. 5. Hand does not contain sufficient number of leaves.

No. 6. Too great a number of leaves tied in hand.

No. 7. Hand of correct size and properly tied.

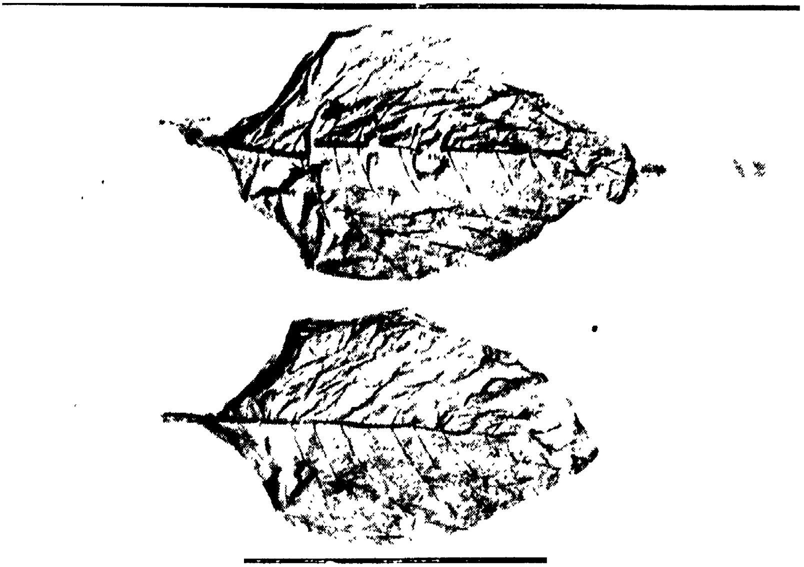


Plate No. 3.

No. 1. Leaf with sound stem

No. 2. Leaf with broken stem.

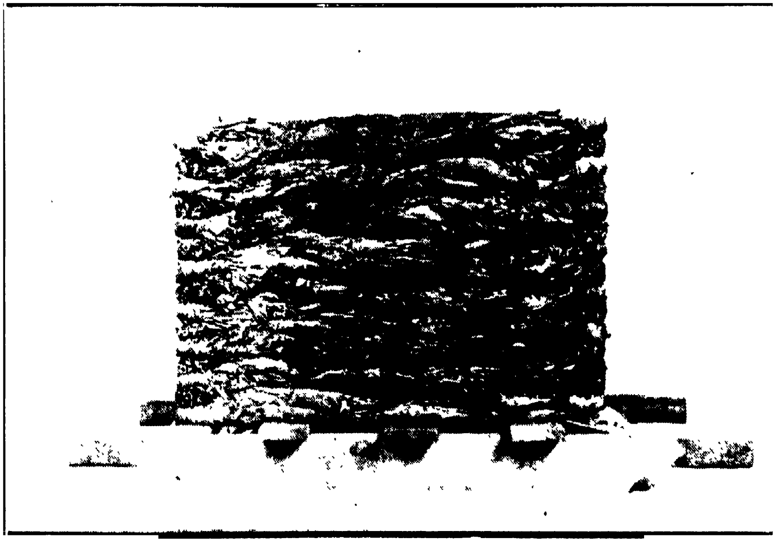


Plate No. 4.

Side view of tied leaf after being pressed.

The method of placing layers in bale is illustrated.

displaced. Leaf forming the centre of the bulk need not be so carefully placed as to have the butts facing any particular direction. When one complete layer has been bulked, the next layer is placed on top, starting from the outside and working towards the centre as before; this process is continued until the bulk is completed. The corners may be slightly rounded off, as it is more difficult to make them square. The sides and ends of the bulk should be kept straight and perpendicular.

When bulking, the leaves must be straightened out and not be bent double so that the tip lies on the butt. Tobacco should never be "pastelled" or flattened out, but should be bulked just like it comes off the stick. Weights are placed on the top of the bulk to press the tobacco down. On the outside of the bulks no leaf should be seen—only the butts of the tobacco should be visible.

The bulks of tobacco should be subjected to regular and careful inspection, and should any tobacco be found to be heating up or fermenting too much, through the leaf being in too high condition, the bulk must be broken down and rebuilt after the leaf has been shaken out and aired. When turning bulks the tobacco which formed the centre of the old bulk is placed to the outside, and in the same way the bottom tobacco is placed on the top of the new bulk; this assists in attaining greater uniformity in the leaf.

Grading.—All tobacco must be graded before it can be offered for sale. There has been a tendency of late for growers to send in ungraded leaf to the tobacco warehouse. When such is the case it is impossible for the grower fully to realise the class of crop he has produced, and in many instances he is dissatisfied with the results as indicated in his financial returns at the end of the season. It must be realised that the most competent and experienced handling in a grading warehouse cannot turn poor leaf into tobacco of good quality, and unless the grower actually handles his tobacco himself, he cannot know all he should about his crop. At the present time the facilities offered by existing commercial grading warehouses are inadequate to handle, within a reasonable time, the whole of the tobacco crop produced in this Colony. It would therefore appear to be desirable for grading to be done on the farm.

The tobacco is now removed from the bulk, starting first with the bright leaf, if this has not already been graded and baled. If the tobacco has become too dry in the bulks, it should be conditioned for handling. When ready, the tobacco is placed on the tables in the grading shed, where it is sorted out according to colour, size and texture.

The advantages of the rough grading before bulking now become apparent, for the graders are working on only one class of leaf at a time, and are not so confused as when a greater number of grades are before them on the grading tables. On the first table there are six divisions, one each for the following grades:—Straight leaf, slightly perished or torn, badly perished or torn, green, spotted leaf and sponged leaf. The straight grade leaf is then collected for further sub-division and taken for final sorting to another table with four divisions, which are for grades Nos. 1, 2, 3 and leaf with greenish tinge. The slightly perished or torn leaf is next graded out in similar fashion, and so on until the last of the grades from the six divisions has been dealt with. The medium leaf is graded after the bright leaf, and then the dark leaf, followed by the green tobacco. The graded tobacco is now tied up into "hands" or bunches of leaves, sufficient leaves being placed in each hand to make the butt measure about one inch in diameter; when made too big, the hands become unfastened more readily. The hand of tobacco is tied by a leaf suitably folded to form a binder, the mid-rib being placed to the inside so that it will not be visible when the hand is bound. The leaves are held in the left hand, and with the other hand the butts are beaten down until they are all level. The binder is then held with the tip pressed firmly by the left thumb against the hand of tobacco and wound round until about four inches remain; the butt end of the binder is then pulled across through the middle of the hand of tobacco, and keeps the tie leaf securely in place. Only leaf of similar grade and length should be tied in the same hand of tobacco. The tie leaf must be of the same grade as the tobacco in the hand; a leaf of medium length is best suited for the purpose.

Tobacco under eight inches in length is not tied into hands, but is baled as loose leaf. It is not desirable to bring the binder too far down the hand; the top edge of binding

should be level with the butts and the lower edge not more than one-and-a-half to two inches below the top.

When grading tobacco, growers are inclined to concentrate more on the lettering of the grades; a simple rule is to grade like to like. A description of the standard grades is given below, and will give an idea of what is required:—

B.S.—Clear lemon to light orange, fine texture, free from damage by disease, insect pests or bad handling; no green.

B.S.G.—Same as above, but pronounced greenish yellow colour.

B.S.P.—Same as B.S., but somewhat perished by being overripe, or damaged by disease, insect pests or bad handling.

B.A.—Slightly heavier bodied than B.S., not so bright, slightly overripe, but no green.

B.A.G.—Same as above, but pronounced yellowish green colour.

B.A.P.—Same as B.A., but somewhat perished by being overripe or damaged by disease, insect pests or bad handling.

B.L.—Still bright in colour, but can contain overripe, heavier, darker and not so clean leaf as B.S. or B.A.

B.L.G.—Same as above, but decided greenish yellow colour.

B.L.P.—Same as B.L., but somewhat perished by being overripe or damaged by disease, insect pests or bad handling.

M.I.—Leaf of good body, clean, uniform, light red to light orange in colour.

M.I.G.—Same as M.I., but has green colour on one side of leaf.

M.I.P.—Same as M.I., but perished by being much overripe, sponged or damaged by disease, insect pests or bad handling.

M.S.—Similar to M.I., but not quite so clean or clear in colour; may contain slightly sponged leaf.

M.S.G.—Same as M.S., but green on one side of leaf,

M.S.P.—Same as M.S., but perished by being overripe, sponged or damaged by insect pests, disease or bad handling.

M.B.—Heavier in body and texture, red to reddish brown, sponged, but otherwise sound.

M.B.G.—Same as M.B., but with greenish colour.

M.B.P.—Same as M.B., but perished by being badly sponged, overripe, bad handling, disease or insect pests.

D.U.—Heavy texture, full body, oily leaf, clean, uniform, colour dark mahogany or dark brown with spots of yellow or light red.

D.U.G.—Same as D.U., but contains some green.

D.U.P.—Same as D.U., but perished by being overripe, bad handling, etc.

D.R.—Heavy body, dark red to brown colour.

D.R.G.—Same as above, but greenish colour.

D.R.P.—Same as D.R., but perished by being overripe, bad handling, etc.

D.Y.—Not so clear or uniform, sound, but may vary between light brown to black, almost lighter in body and texture than D.U. or D.R.

D.Y.G.—Same as D.Y., but decided green colour.

D.Y.P.—Same as D.Y., but perished by disease, etc.

B.G.—Bright leaf, with higher percentage of green.

B.P.—Bright leaf, badly spotted, sponged and broken.

B.P.2.—Same as above, but a little more inferior.

M.G.—Medium leaf, with higher percentage of green.

M.P.—Medium leaf, badly spotted, sponged and broken.

M.P.2.—Same as M.P., but a little more inferior.

D.G.—Dark coloured leaf, with higher percentage of green.

D.P.—Same as D.G., but very badly perished and broken.

B.X.L.—Bright coloured scrap, free of stems or portions of leaf less than one square inch.

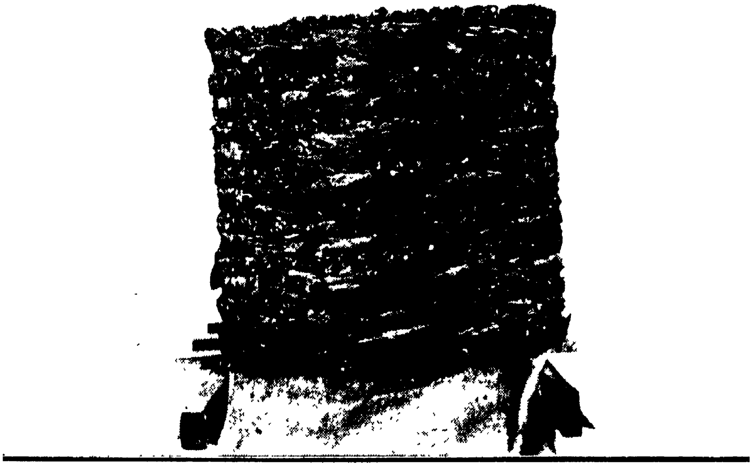


Plate No. 5.
End view of tied leaf after being pressed.

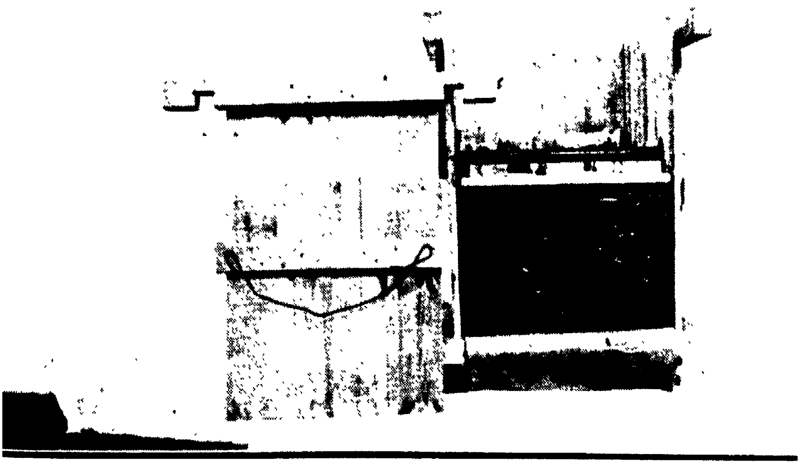


Plate No. 6.
A pressed bale kept under pressure by two iron bars until tobacco is properly set.

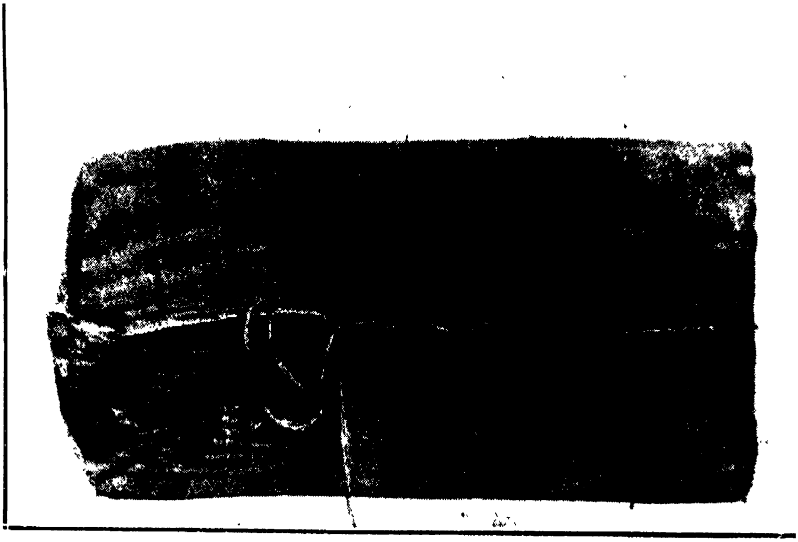


Plate No. 7.
Properly packed and handled bale.
The method of sewing illustrated.

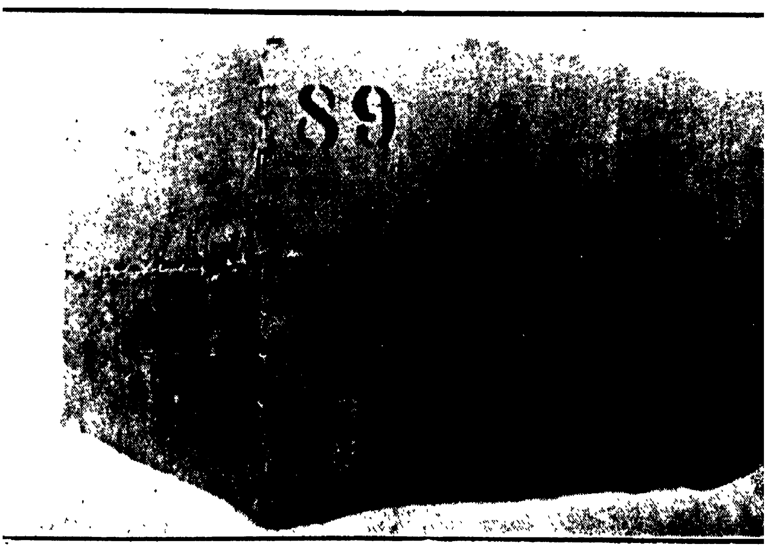


Plate No. 8.
Bale showing grower's registered number in top left hand corner and consecutive number in bottom left corner of bale.

Plate No. 9.
Badly handled bale a fruitful source of scrap tobacco.

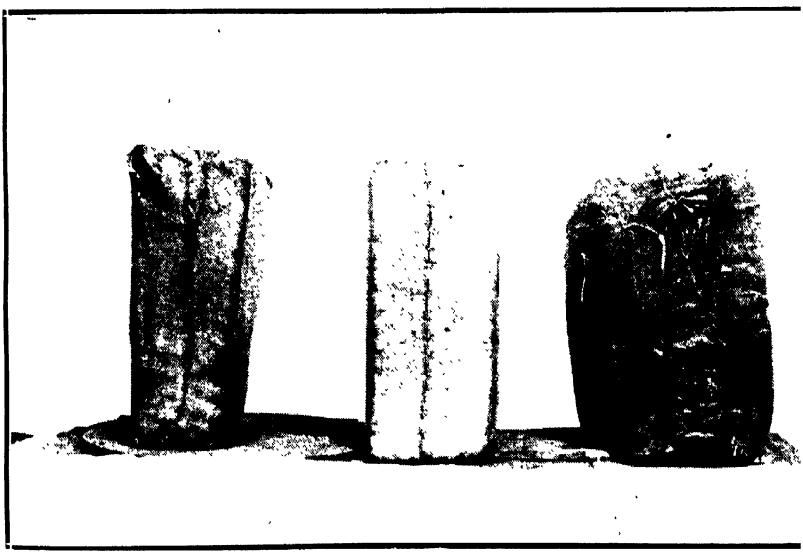


Plate No. 10.
Left: Badly handled farm graded bale.
Right: Very badly handled ungraded bale.
Centre: Correctly handled bale of farm graded or ungraded tobacco.

M.X.L.—Medium coloured scrap, free of stems or portions of leaf less than one square inch.

D.X.L.—Dark coloured scrap, free of stems or portions of leaf less than one square inch.

L.L.B.—Bright leaf under eight inches in length.

L.L.B.G.—Same as B.G., but under eight inches in length.

L.L.B.P.—Same as B.P., but under eight inches in length.

L.L.B.P.2.—Same as B.P.2, but under eight inches in length.

L.L.M.—Medium leaf under eight inches in length.

L.L.M.G.—Same as M.G., but under eight inches in length.

L.L.M.P.—Same as M.P., but under eight inches in length.

L.L.M.P.2.—Same as M.P.2, but under eight inches in length.

L.L.D.—Dark leaf under eight inches in length.

L.L.D.G.—Same as D.G., but under eight inches in length.

L.L.D.P.—Same as D.P., but under eight inches in length.

The prefix L.L. denotes loose leaf, and these grades are not tied into hands for baling, the leaf being under eight inches in length.

The alphabetical arrangement of grades is that the index letter indicates whether the leaf is bright, medium or dark; thus, bright grades have index letter B, the medium grade M, and the dark grades D. The letter G indicates green and P means perished leaf.

Not all of the above grades are produced in any one crop of the size usually produced by individual tobacco growers during the season.

Baling.—After the tobacco is tied in "hands" it is bulked or stored until there is a sufficient quantity of a grade to make a bale. When bulked the operation of baling is similar to that of bulking the crop when first conditioned,

the only difference being that in the latter instance the leaf has not been tied into hands. Another method is to place the hands on sticks and hang them up on suitable racks placed in the grading shed. If the foregoing method is employed, care should be taken to divide the hand at right angles to where it was divided for the fixing of the butt end of the tie leaf, otherwise the binder will tend to unwrap itself when the hand is straddled over the stick.

The condition of the leaf is very important in the baling process; too much moisture may cause mould or darkening of the leaf, with resultant loss in value; and too little means breakage and scrap.

For baling, the correct condition is when the body and tip of the leaf are pliable, but not soft, and the mid-rib breakable but not brittle for most of its length.

Baling Ungraded Leaf.—If the tobacco is not being fully graded on the farm, it must be packed in bales for despatch to a grading warehouse. The method of packing ungraded leaf is first to place a strip of hessian along the bottom and up one end of the baling box, leaving the other end of the hessian protruding about 12 inches out of the bottom, with the removable end closed down on it. The length of hessian required for each bale is nine feet. Leaf is then placed in layers with the butts towards the end of the press and the tips towards the centre; this is repeated at the other end, leaving the tips of both layers meeting or overlapping along the middle of the box. Another layer to form a bond is placed, butts towards the end of baling box, about six inches in from the end of butts of first layer.

To consolidate further the bale and for the protection of the butts a layer of less thickness is placed at right angles across the ends of the bale. These "header" layers should be placed with butts tightly packed into the corners and should just cover up the butts of the leaf forming the layer beneath. The next layer placed in the box should be in the same position as the one forming the beginning of the bale. The layer which forms the bond, in the middle of the bale, is alternated; for instance, if the first middle layer is placed butts to left end of press, the next one should be reversed so that the butts face the right hand end.

Each layer should be about one-and-a-half inches thick at butts. These operations are repeated until the required quantity of tobacco is packed into the baling box. Broken mid-ribs are a fruitful source of scrap, and the same care which has been exercised from the time the tobacco was removed from the barn and through subsequent handlings should still be continued in the baling process.

In order to press down each layer of tobacco into position in the box, a smooth board about 12 inches wide and 23 inches long should be used, but extreme care must be taken, otherwise the stems of the tobacco may be broken. When the requisite amount of tobacco has been packed in the baling box, the top of the press is placed on the tobacco and pressure applied by means of the screw until the depth of the bale is 16 inches. The standard size bale measures 34 ins. x 24 ins. x 16 ins. deep, and should not weigh more than 160 lbs. to 180 lbs. in the case of ungraded leaf.

It is quite possible to get a greater weight of tobacco into the cubic capacity of a standard size bale; this, however, would result in bruising and thereby reduce the value of the leaf. Too much moisture in the tobacco or too great a pressure will make a standard sized bale weigh heavier than the 180 lbs. limit. If it is found that the bales are being turned out overweight, it would be as well to watch the condition and pressure of the tobacco.

When packed too wet or with too great a pressure, the leaf turns darker in colour and may become mouldy. It will also be difficult to open a tightly pressed bale and remove the leaf without damage for grading purposes.

Baling Tobacco tied in Hands.—The hands of tobacco are placed in single layers in the press, and the bale is built up in a manner similar to that described for loose leaf. The bales are of the standard size, but should weigh approximately 200 lbs. When packing, care must be taken to see that the leaf is in proper condition, and that all the hands are of the same grade; mixed grades will cause a reduction in value of the bale. The bale is kept under pressure for about twelve hours in order to allow the hands to bind properly. As soon as the pressure is released the hessian covering should be sewn at once to prevent the bale springing, a hitch stitch being used. The most convenient arrangement is to have

more than one baling box, so that baling may be carried on without undue delay. These boxes are pushed under the screw and pressed while the next box is being packed. When sufficiently pressed the top of each box is kept down on the tobacco by iron bars pushed through holes drilled at the correct level in each side and so holding the tobacco under pressure after the box is removed from under the screw.

Another type of baling box is provided with loose bottom, and the sides are hinged at the corners to permit of easy removal from under the press when the bale is fully pressed down. After the sides of the box have been folded back on their hinges and removed from encasing the bale, steel bars with suitably formed ends are hooked over each end and hold firmly together the boards on top and bottom of the bale.

With this type of baling box the hessian is arranged differently to when a non-collapsible box is used, two pieces of hessian each 4½ feet long being required. One strip is placed on the loose bottom and an overlap of nine inches folded over and under either end of the board before any leaf is placed in the press. A similar strip is put on top of the tobacco before it is finally pressed, being so placed that the overlap comes up over each end of the top board. After the sides are removed and before the hooks are placed in position, both the overlaps at each end should be drawn so that the hessian can be sewn before the boards are removed from the bale.

After the tobacco bales are properly sewn and stencilled with the necessary distinguishing marks, they are ready for despatch from the farm.

It is the usual custom to store the baled tobacco on the farm until there are a sufficient number of bales to make a wagon load, or, in the case of wet weather, until weather conditions are favourable.

It is important to store baled tobacco in a suitable manner, as neglect of a few commonsense precautions will seriously affect the value of the leaf. The bales should be placed on platforms raised off the floor in a similar manner to the bulking beds.

The top surface of these platforms should not be rough or uneven, otherwise the hessian will be torn and the tobacco damaged.

It is not advisable to have the bales stacked up too high; three bales placed one on top of another (flat side down) is high enough.

These bales require frequent turning, so that the bottom bale, when removed, is placed on top. If the same bales were always left at the bottom, the continued pressure, caused by the weight of the top bales, would tend to bruise and damage the tobacco.

When loading up for transport from the farm, care should be taken to have the bales firmly and securely placed flat down on the wagon.

The writer has frequently observed wagon loads of tobacco bales on the road to the nearest railway station without any covering to protect them from the sun or possible showers of rain. It is hardly necessary to point out that this is a most unsatisfactory arrangement, and that suitable protection should be provided for the tobacco *en route* to the warehouse.

Inexperienced growers would obtain great benefit by actual demonstration in the conditioning and handling of tobacco, as there are certain details which cannot be properly grasped through perusal of reading matter alone.

In conclusion, it may be stated that unless reasonable care and proper attention to detail are exercised in the handling of tobacco, the maximum financial returns cannot be fully realised, and the tobacco industry will not make the full amount of progress of which it is capable.

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, 1925-26.

By H. C. Arnold, Manager.

During the season under review the total rainfall at this station was 33.08 inches. This is about one inch more than the mean annual precipitation, but though the season was normal as regards total rainfall, the shortage of rain during December caused reduced stands among several of the crops through uneven germination.

With the advent of the new year, however, the rains fell more frequently and in larger quantities, with proportionately beneficial results.

ANALYSIS OF RAINFALL SEASON 1925-26.

Month.	No. of rain days.	Total for month in inches.	No. of rains of over ½ inch.	Total to date.	Periods exceeding one week without rain.
October ...	4	2.57	2	2.57	1st-17th and 24th-31st
November...	5	2.33	4	4.90	1st-15th and 17th-26th
December...	9	1.88	2	6.78	19th-25th
January ...	18	5.80	7	12.58	Nil
February ...	20	5.99	6	18.57	Nil
March ...	14	12.88	9	31.45	Nil
April ...	2	1.63	1	33.08	7th-30th
Totals ...	72	33.08	31	33.08	6 periods of 7 days or over

It is to be regretted that it has not been found possible to prepare this report earlier, but this is a task of no small difficulty, as the station staff is limited and at all times exceptionally busy. It is realised, however, that the value of a report of this character is decreased if not issued at the proper time.

The results of experiments conducted at this station have been published each year in the *Rhodesia Agricultural Journal* since 1919-20, and are available for reference in bulletin form.

A number of new experiments were started this year, the most important of which are: (1) Tobacco variety trials with the heavy leaf type suitable for "fire-curing." (2) Liming trials on land sown to maize, sunflower, cotton, ground nuts and haricot beans. (3) Trials to ascertain the relative value of Sunn hemp, velvet beans and dolichos beans when used for green manuring purposes. (4) Variety trials with a plant known as "Adlay" (*Coix lacryma-jobi*), which is said to be used in its native country as a substitute for wheat.

The importance of the maize crop in this Colony entitles it to a foremost place in the experimental work undertaken at this station. The problems connected with it bear mainly upon the possibility of increasing the acre yields of grain, combined with the permanent maintenance of soil fertility. In this connection the rotational trials started thirteen years ago afford very valuable data on the results obtained with certain methods of cropping, as the following tables show:—

Maize Yields in Bags per Acre.

Series A, 1913-1926. System of cropping.	1925-26. Rainfall, 33.08 inches.	1924-25. Rainfall, 52.28 inches.	1923-24. Rainfall, 16.32 inches.	1922-23. Rainfall, 42.69 inches.	1921-22. Rainfall, 16.82 inches.	1920-21. Rainfall, 33.4 inches.	1919-20. Rainfall, 30.98 inches.	Average yields.
(1) Maize continuous, 13th year without manure or fertiliser	7.8	2.3	4.2	2.4	3.75	13	11.5	5.8 (12 years)
(2) Alternate maize and bare summer fallow, no manure or fertiliser	16 3	2.05	12.8	5.1	13 25	21.5	20.5 *	12.05 (11 years)
(3) Three-course rotation, maize-oats-velvet beans, no manure or fertiliser	15.5	19.45	12.5	15 5	12.75	21 5	20 9	15 07 (11 years)
(4) Four-course rotation, maize, plus 6 tons dung per acre, oats-velvet beans-maize .	24 4	26 8	11.3	18 9	11.25	35	20.1	18.92 (10 years)

On the maize continuous plot a remarkable increase in yield was obtained this season, which calls for some explanation. Reference to the amount of rainfall for each season shows that the yields obtained from this plot are highest in those seasons with a rainfall of about 33 inches, but when the rainfall varies much either above or below that amount, there is a serious decrease in the yield. Although the yield this season is over three times as heavy as that of last season, it is little more than half that of 1920-21, which was the last "normal" season, showing that the inherent fertility of this plot is being rapidly depleted by this pioneer method of farming. In a favourable season, therefore, the farmer who grows maize on the same land continuously may be misled by comparatively satisfactory yields, but when a series of unfavourable seasons is experienced, he will be disillusioned and astonished by the discovery of the extent to which his land has become impoverished.

A glance at the results obtained when the maize is grown in rotation with other crops shows that the yields of those

Plate No. 1.

First series rotation experiments.—Maize on the plot which has grown maize for 13 years in succession without manure or fertiliser; yield 7 to 8 bags per acre. Agricultural Experiment Station, Salisbury.

Plate No. 2.

First series rotation experiments.—Maize in three-course rotation; no manure or fertiliser applied; yield 15 bags per acre. Photographed 12th March, 1926. Agricultural Experiment Station, Salisbury.

Plate No. 3.

First series rotation experiments. Maize in four-course rotation. Land receives six tons per acre farmyard manure every fourth year; yield 24.4 bags per acre. Agricultural Experiment Station, Salisbury.

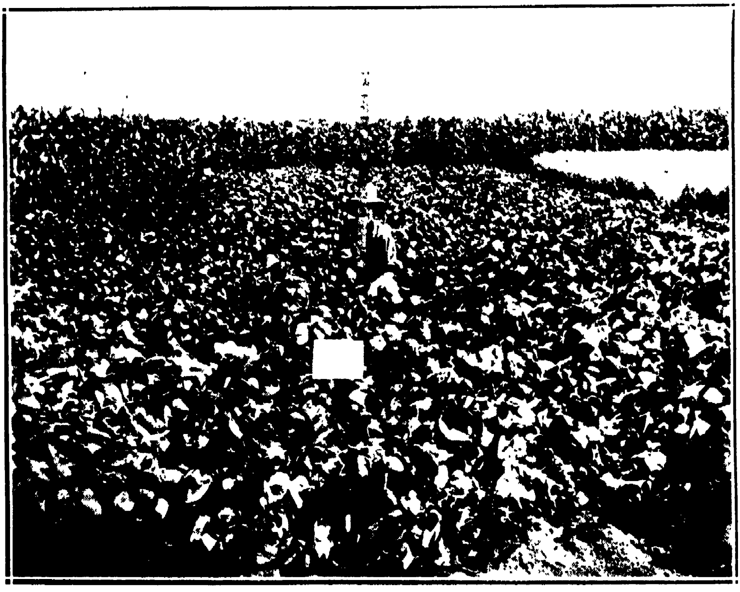


Plate No. 4.

First series rotation experiments.—Velvet beans in three-course rotation. The land has been under cultivation for 14 years and has received no manure or fertiliser. Photograph taken 12th March, 1926. Agricultural Experiment Station, Salisbury.

plots have not been affected nearly as much by seasonal changes as have the yields of the maize continuous plot.

When comparing the yields given in the above table, it should be remembered that, whereas on the maize continuous plot a crop is taken from the land every year, the plots on which maize alternates with bare fallow yield a crop but once in two years, so that while these plots have yielded but six crops each during the period 1914 to 1926, all the other plots in these trials have borne twelve crops each during that period.

The effect of the various systems of cropping on the permanent fertility of the soil is shown by the following table, in which the yields obtained during the period 1914-15 to 1919-22 are compared with those for the period 1922-23 to 1925-26.

Yields in Bags per Acre.

	Total yields.		Average yields.		Difference between average annual yields of first period and that of past 4 years.
	1915-22.	1923-26.	1915-22.	1923-26.	
Maize continuous ...	59.11 (8 crops)	16.7	7.39	4.18	Decrease, 3.21
Maize alternating with bare fallow	106.25 (7 crops)	36.25	15.18	9.06	,, 4.12
Maize on 3-course rotation	99.25 (7 crops)	62.95	14.18	15.74	Increase, 1.56
Maize on 4-course rotation	108.25 (6 crops)	81.4	18.04	20.35	,, 2.26

This table reveals in a striking manner the evil effects of constantly cropping the land in the same way. The second and fourth columns show that the land which has grown maize continuously for twelve years has given a total of 16.7 bags per acre during the last four years or an average of 4.18 bags per acre per annum, while the yields from the maize plots in the three-course and four-course rotations are respectively almost four times and five times as heavy as those obtained from the plot which has grown maize every year. Besides this, the land which has grown maize constantly is at present yielding little more than half as much as it did for the

first eight years, while the yields from the rotation plots have actually increased during recent years.

More convincing evidence of the beneficial effects of judicious crop rotation would be difficult to find, and when this is coupled with moderate manuring the results are still more noticeable. These experiments demonstrate that by a well-planned system of rotation cropping the fertility of the land can be increased and heavy yields secured, and at the same time the effect of the vagaries of the weather can be insured against to a considerable extent.

Maize Rotation Experiments—Series B.—At the time these experiments were started, viz., 1919-20, the maize crop was the dominant one throughout the country, and it was thought that while the crop rotations called Series A served to show the advantages of a three or four-course rotation, only a limited number of Rhodesian farmers were able to adopt such systems under the conditions which prevailed at that time. These being economically impracticable, except for stock farmers, a further series of crop rotations were commenced which were more in keeping with the economic conditions of the time. In one of these systems, the fertility of the soil is maintained by the application of eight tons of farmyard manure per acre every fourth year, while once in the rotation Sudan grass is grown, the stubble of which is ploughed under, and the land is thereby enriched to a small extent. In the second system, a crop of velvet beans is ploughed under every fourth year to maintain the supply of organic matter and nitrates, while one intermediate maize crop receives a dressing of 150 lbs. of bone and superphosphate.

These rotations support the conclusions which have been drawn from the results of the older rotations, and while there is a serious reduction in the yield from the maize continuous plots, that of the rotation plots has been well maintained. The effect of favourable and unfavourable seasons on the yield of the maize continuous plots in this series is now becoming as pronounced on these plots as on those of the older series.

Yields of Maize in Bags per Acre.

Plot 1.—Control. Maize continuous. No manure or fertiliser.

Seasons and Yields.

1925-26.	1924-25.	1923-24.	1922-23.	1921-22.	1920-21.	1919-20.	Average over 7 years.
12.0	3.6	10.0	10.4	13.0	27.2	25.5	14.53

Plots 2-5.—System F. Three-quarters of land under maize, one-quarter under Sudan grass. Each year one-quarter under maize, commencing with plot 2 in 1919-20, receives eight tons of dung per acre.

Plot No.	1925-26	1924-25.	1923-24.	1922-23.	1921-22.	1920-21.	1919-20.	Average over 7 years.
2	S	21.75	16.7*	12.6	S	28.0	26.0*	21.01 (5 crops)
3	21.5	8.65*	11.5	S	14.25	26.9*	23.7	17.75 (6 crops)
4	24.5*	15.1	S	18.6	15.7*	28.5	S	20.50 (5 crops)
5	18.9	S	13.5	17.3*	13.7	S	24.6	17.60 (5 crops)

An asterisk indicates the application of farmyard manure.

This season the Sudan grass was sown on 4th December. The first cutting of fodder was taken on 10th February, a second on 6th March, and a final cutting was made on 1st June. The total weight of green fodder reaped was 19,470 lbs. per acre. The first two cuttings were converted into silage, while the third was made into hay. It is estimated that the total yield was equivalent to four tons of hay per acre.

In plot No. 3 the low yield of maize recorded for 1924-25 is thought to have been due to the very fresh kraal manure which was used that season. It will be noticed that the loss was largely a temporary one, for it was compensated for—to some extent at least—the next season by an increased return of approximately 13 bags per acre.

Plot 6.—Control. Maize continuous. No manure or fertiliser.

Seasons and Yields.

1925-26.	1924-25.	1923-24.	1922-23.	1921-22	1920-21.	1919-20.	Average over 7 years.
14.0	7.75	8.4	13.1	11.75	24.2	23.3	14.64 (7 crops)

Plots 7-10.—System H. Three-quarters of land under maize, one-quarter under velvet beans which are ploughed under for green manure. One-quarter under maize, commencing with plot 7 in 1919-20, receives 150 lbs. per acre of fertiliser each year, *i.e.*, each field receives fertiliser once every fourth year and once every four years is green manured.

Plot No.	1925-26.	1924-25.	1923-24.	1922-23.	1921-22.	1920-21.	1919-20.	Average over 7 years.
7	Beans	6.65	11.5†	18.8	Beans	25.9	23.1†	17.19 (5 crops)
8	13.8	19.85†	13.0	Beans	11.7	24.6†	23.0	17.66 (6 crops)
9	15.8†	15.65	Beans	17.4	12.7†	28.7	Beans	18.05 (5 crops)
10	20.2	Beans	9.6	21.1†	14.5	Beans	19.2	16.9 (5 crops)

A dagger indicates the application of fertiliser.

Maize following Various Crops.—The effect which a crop is likely to exert on the crop which follows it in a rotation is a matter which farmers need to take into consideration. With the object of determining the effect of our principal crops on the succeeding maize crop, trials extending over five seasons have been carried out with results as shown in the following table. The legumes grown comprise velvet beans, dolichos beans, Sunn hemp, ground nuts and haricot beans; the oil seeds include cotton, linseed and Niger seed. The cereal and grass crops are oats and Sudan grass, while *hibiscus cannabinus* and buckwheat are also included in these experiments. In each instance referred to here, the crop was reaped in the manner common to its kind, and the stubble only was left to be ploughed under. This season's maize yields confirm the results of previous experiments, excepting on the cotton plot, where the yield of 13.5 bags per

acre exceeded that obtained after that crop at any time during these experiments.

The highest yield was that of the plot which carried Sunn hemp the year before and amounted to 18.5 bags of maize per acre, while the lowest returns were those following (a) linseed, (b) oats, (c) buckwheat.

Average Maize Yield in Bags per Acre.

Kind of crop.	1925-26.	1924-25	1923-24.	1922-23.	1921-22.	Average over 5 years.
After legumes, including haricot beans ...	13.9	10.35	10.86	9.08	9.18	10.67
After legumes, not including haricot beans	14.5	11.96	...	...	...	13.23
After oil seeds ...	10.25	6.74	8.10	8.41	8.44	8.79
After grass crops ...	11.5	4.5	7.10	7.75	8.84	7.94
After miscellaneous crops	10.8	3.7	5.06	6.25	7 56	6.67

A striking feature about these trials is the beneficial effect which the leguminous crops have had on the fertility of the soil; the average yield of maize following these crops is higher now than it was when the trials were started, while the average yields following the other crops have decreased during the same period. No kraal manure or fertiliser has been applied to any of these plots at any time.

Green Manuring with Immature versus Mature Crops.—The primary object of this experiment was twofold, namely, to ascertain whether the ploughing in of two consecutive crops in the same season would have toxic effects on the land, or whether by adding a greater amount of organic matter it would be more beneficial than the ploughing under of only one crop. It was found that the growing season was too short to permit of two velvet bean crops maturing, and they were therefore turned under before reaching the podding stage. The results of the first series of experiments were so overwhelmingly in favour of one fully matured crop that it was decided to repeat the experiments again. Crops of velvet beans were grown for this purpose in 1924-25, and the first crop of maize following them was reaped during the period

under review. The yields obtained were as shown in the following table:—

Yields of Maize in Bags per Acre.

Treatment.	1925-26.	Average, 1923 to 1925.	Average, 1923 to 1926.
One mature crop ploughed under	15.65	14.2	14.93
Two immature crops ploughed under	14.90	12.4	13.65
One mature crop reaped, stubble only ploughed under	14.94	11.8	13.37

These experiments gave rise to the question of whether, irrespective of weight of green stuff per acre, immature crops ploughed under will benefit the land as much as if the crops are fully grown, for it is known that mature plants contain a higher percentage of organic matter than immature plants. To gain more knowledge on this problem sowings were made in 1923-24. The maize crop on two plots was so poor the first season that it was decided to fertilise the whole area with 250 lbs. bone and super per acre in 1925-26.

Maize Yields in Bags per Acre.

Treatment.	1924-25. Rainfall, 52 inches.	1925-26. Rainfall, 33 inches.	Average over two seasons.
		250 lbs. fertiliser.	
Sunn hemp ploughed in when in green pod (17th March, 1924) ...	15.5	20.61	18.08
Sunn hemp ploughed in when in early flower (8th February, 1924)	8.2	19.89	14.05
Bare fallow	4.1	19.53	11.82
Velvet beans ploughed in when in green pod (15th April, 1924) ...	8.5	12.75	10.62
Velvet beans ploughed in when in early flower (21st February, 1924)	5.2	12 53	8.88
Bare fallow	1.0	12.39	6.69

The remarkable differences between the yields of these plots this season and the yields of the same plots last season modify last year's results very considerably. The more favourable climatic conditions this year, coupled with a liberal application of fertiliser, have enabled the plots which gave low yields last season to increase their yields so much that they compare favourably with those which gave the highest returns last year. This seems to indicate that the beneficial effect conferred by a green manuring crop is most pronounced during the first season after its application, particularly if it is one with heavy rainfall. From the data in the first column it would appear that the amount of moisture in the soil caused the organic matter to decay quickly, which, being rendered available as plant food, was rapidly absorbed by the maize crop. Also, the presence of a large quantity of vegetable matter opens up the soil, thereby permitting proper aeration and favouring both chemical and biological reactions which play so large a part in rendering the locked up stores of plant food available for use by the plants. On the plots which lacked vegetable matter these beneficial processes would be checked by the cold and sodden condition of the soil. It is thought, therefore, that the relative value of immature and mature crops for green manure can be more accurately gauged by comparing the average yields for the two seasons, rather than by considering the yields for either season separately. It is obvious that a fully developed crop has a more beneficial effect than a partially developed one, but that an immature crop is far better than none. These experiments are being continued on a new series of plots, and the results of these will be reported on at the end of each season.

Maize and Velvet Beans grown together for Grain.—The expanse of bare soil under the maize crop suggests that a cover crop might be grown with it to advantage. A crop which is dissimilar to maize in its manner of growth and its food requirements would be the least likely to reduce the grain production. Theoretically the velvet bean would be suitable for this purpose, and the practice of growing velvet beans with the maize appears to be gaining in favour among Rhodesian farmers. Trials have been conducted here for a number of years to ascertain the effect on the yield of grain

which the presence of velvet beans is likely to have. They prove that climatic conditions exert a big influence on the success or failure of the practice, for, when excessive rains fall, the velvet beans suffer more when sown with maize than they do when grown by themselves. On the other hand, when the rainfall is below normal, a moderate crop of beans is reaped, but the yield of maize is considerably reduced. On very fertile land, particularly when the beans are sown too thickly, their vines are liable to become interlaced across the rows of maize to such an extent as to interfere with the harvesting operations, but on land which is somewhat exhausted, fair yields of both crops are obtained. The legume has a beneficial effect on the soil, and the grazing after the two crops are reaped is somewhat better than it would be from maize stalks alone.

The methods of planting followed in these experiments are:—(1) Maize 40 inches by 18 inches, velvet beans drilled between the rows of maize; (2) maize 40 inches by 18 inches, velvet beans sown fourteen days later in the same row; (3) maize 40 inches by 24 inches apart, beans sown fourteen days later in the same row; (4) maize 40 inches by 30 inches, beans sown fourteen days later in the same row. This season, for the first time, a plot carrying maize only is added to the series.

In order that the first method of planting might be comparable with the second method, the rows of maize are sown at the same distance apart in both cases. While this is necessary for the purposes of this experiment, it might be found impracticable under field conditions to have the rows of maize and beans with only twenty inches between, for that would not allow the type of cultivator in general use in Rhodesia to pass between the rows. In practice, therefore, when the two crops are sown in alternate rows, these must be wide enough apart to allow the implements used during cultural operations to pass between the rows of plants.

Plate No. 5.

First series rotation experiments. Velvet beans in a four-course rotation in which the land receives six tons per acre of farmyard manure every fourth year. The velvet beans are the third crop after the manure was applied, but their luxuriant growth, compared with that of the three-course rotation, shows how the manure has benefited the beans.

Plate No. 6.

Sunflower plus one ton of lime per acre plus eight tons dung per acre. Agricultural Experiment Station, Salisbury.

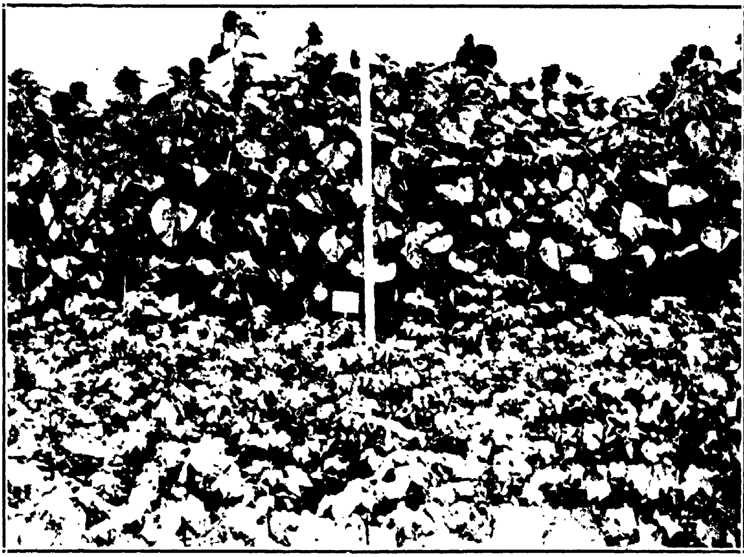


Plate No. 7.

This crop is as good as that which received one ton of lime per acre in October, 1925, showing that the lime had had no effect by the 12th March, 1926, when all the crops were photographed. Sunflower plus eight tons dung, no lime.

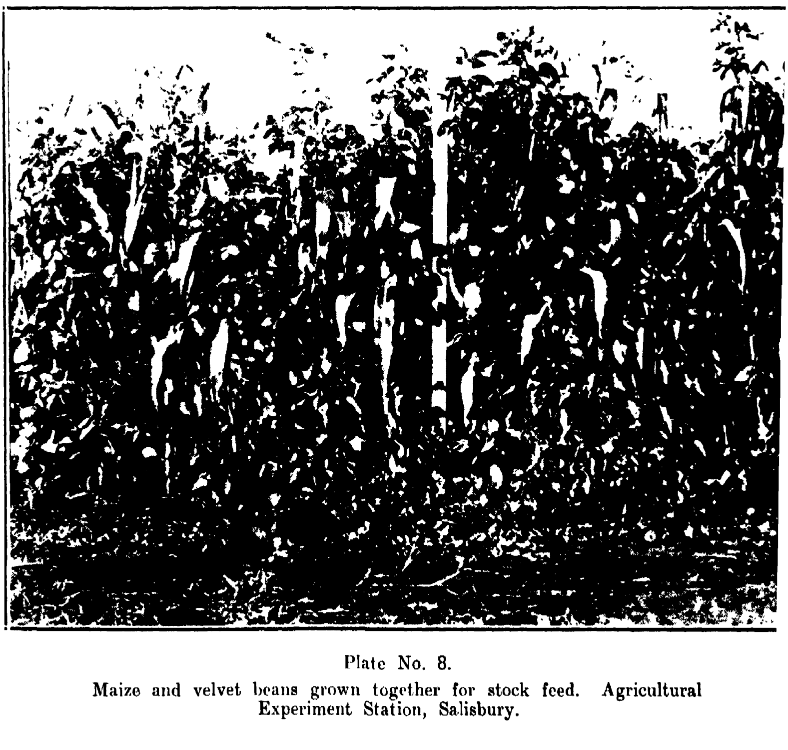


Plate No. 8.

Maize and velvet beans grown together for stock feed. Agricultural Experiment Station, Salisbury.

Yields in Bags per Acre.

Method of planting	1925-26. Rainfall, 33 inches.		1924-25. Rainfall, 52.28 inches.		1923-24. Rainfall, 16.32 inches.		1922-23. Rainfall, 42.69 inches.		Average over 4 years	
	Maize.	Beans.	Maize.	Beans.	Maize.	Beans.	Maize.	Beans.	Maize.	Beans.
No. 1	12.15	2.85	22.0	.53	7.70	3.22	20.0	.33	15.46	1.73
,, 2	13.90	2.20	22.4	.36	7.48	2.03	20.4	.16	16.05	1.19
,, 3	12.90	2.05	17.5	.39	7.80	2.06	18.4	.44	14.15	1.24
,, 4	11.75	2.35	15.1	.51	8.75	2.17	14.4	.24	12.50	1.32
,, 5	16.45	...	...	...	...	...	...	...	...	...

Maize—Check-rowed v. Drilled.—On the whole, the results of these experiments this year confirm the tests made in previous years, and show that, given equally fertile soils and good stands with clean cultivation, there is no advantage in yield alone from check-row planting, but perhaps rather the reverse. This year the trials were made on quadruplicate plots, and in every case, where the maize was spaced 42 inches by 42 inches apart, with three plants per hill, a markedly reduced yield was the result. In the other check-rowed plots, where the plants are 36 inches by 36 inches, with two plants to each hill, the yields nearly equalled that of the drilled plots.

Maize Yields in Bags per Acre.

Method of planting.	Average of 4 plots, 1925-26.	1924-25.	Average to date.
(1) One plant to each hill 36 ins. x 18 ins. apart. 9,680 plants per acre	17.33	21.3	19.31
(2) Two plants to each hill 36 ins. x 36 ins. apart. 9,680 plants per acre	17.05	18.6	17.83
(3) Three plants to each hill 42 ins. x 42 ins. apart. 10,688 plants per acre	12.67	14.9	13.79

Maize Distance Planting for Grain.—These trials were commenced on lines suggested by Mr. H. B. Christian, of the Enterprise district.

Last year, when there was an abundance of moisture, these experiments indicated that heavier yields could be obtained by planting rather closer than is usually advocated, and the results this year favour rows 36 inches apart rather than the wider spacing of 40 inches or over.

Yields of Maize in Bags per Acre.

Distance of planting.	No. of plants per acre.	Average of two plots.		Average of two seasons.
		1925-26.	1924-25.	
24 x 15 ins. ...	17,424	12.4	23.1	17.8
24 x 18 ,, ...	14,520	14 2	19.7	16.9
30 x 15 ,, ...	13,939	17.5	23.1	20.3
30 x 18 ,, ...	11,616	18.2	20.4	19.3
36 x 15 ,, ...	11,616	18.5	20 1	19.3
36 x 18 ,, ...	9,680	17.8	20.3	19.1
40 x 15 ,, ...	10,454	16.6	17.0	16.8
40 x 18 ,, ...	8,712	16.2	17.2	16.8

Maize Variety Trials.—These tests have been carried out for the past seven years with all the varieties of maize most favoured by Rhodesian farmers. In addition to these, a number of new varieties have been introduced from time to time, but it is almost invariably found that new introductions are more susceptible to maize diseases, and for this or some such reason give lighter yields than the recognised standard varieties; they cannot, therefore, be recommended for trial by farmers. Two such varieties which have been under trial here are Krug Corn, a yellow dent, and Moseley Corn, a white dent. Both of these suffered badly from leaf blight, and have been excluded from further trials.

A variety known as American White Flint, which has given satisfactory returns in parts of the Union of South Africa, was included in our trials last year, and its yields compared more favourably with those of our dent varieties than that of any other variety of flint maize yet introduced. It has better disease resistant qualities than the majority of

new introductions possess, and, because it ripens earlier than our standard varieties, it is thought that it may be found to be more suited than they to those districts whose growing season is shortened by late rains and early frosts.

Maize Yields in Bags per Acre.

	Previous average.	1925-26.	1924-25.	Average yield.
Salisbury White ...	13.1 (6 years)	17.2	16.5	13.7
Potchefstroom Pearl ...	13.1 (6 years)	17.1	16.5	13.7
Louisiana Hickory ...	13.0 4 years)	15.6	18 8	13.5
Hickory King ...	12 5 (6 years)	11.6	19.5	12.4
Iowa Silver Mine ...	...	...	14.3	...
American White Flint	...	15.3	...	...

N.B.—It is thought that the low yield recorded for Hickory King is due to the lack of fertility of the soil on which it chanced to be grown, rather than to any inherent weakness of the breed.

Maize following Green Manure Crop sown under Maize during the Previous Summer.—The benefit derived from the practice of green manuring land is generally admitted by our farmers, but many fail to make use of this method of improving the fertility of their soil because of the loss of the season which has to be set apart for growing the crop required for ploughing under. It has been suggested that this difficulty could be overcome by sowing a suitable crop under maize at the time of the final cultivation, which would develop during autumn and winter so that it could be ploughed under before the time for planting the next maize crop had arrived. Only those crops which are resistant to drought and frost would be suitable for this purpose, and a leguminous crop would be preferred.

In order to test the practicability of this suggestion, sowings of dhal, khaki jack bean, white jack bean and dolichos bean were made on 23rd January, 1925, among growing maize. Copious rains followed, and all the leguminous crops grew well with the exception of the dolichos bean,

which does not seem to thrive when it is shaded by other crops. By June the bean crops had covered the ground and were fully 15 inches high, but further growth was retarded by frosts and drought, and they were all ploughed under in September. The land was sown to maize in early December. The following table gives the yields of maize for the two seasons 1924-25 and 1925-26:—

Yields of Maize in Bags per Acre.

Green manure crop.	Season 1924-25. Crops sown under maize 23rd Jan., 1925.	Season 1925-26. Crops ploughed under September, 1925.	Increase.
Dolichos bean	4.05	8.35	4.20
White jack bean ...	5.50	13.75	8.25
Maize only (control) ...	6.15	9.25	3.10
Khaki jack bean ...	5.05	12.50	7.45
Dhal	4.30	10.25	5.95

In the above table the crops are placed in the order in which they were grown in the field. It shows that the plot on which maize was grown alone gave the heaviest yield of the series in the first season. The lower yields from the plots on either side of it suggest that the presence of the bean crop caused a slight reduction in the maize yield, but the still lower yields recorded for the extreme plots were caused by lack of fertility of the soil as well as the influence of the second crop.

The second and third columns show that the favourable climatic conditions of the 1925-26 season accounted for an increase of three bags per acre on the plot which had had no green manure, but that the plots which received green manure returned much heavier increased yields. It should be remembered, however, that the heavy rains during March and April, 1925, favoured the leguminous crops, and enabled them to continue growing until frosts checked them in July. During a season with a normal rainfall these crops might not thrive so satisfactorily, except perhaps on those areas where the stand of maize had become reduced.

(To be continued.)

The Cattle Industry of Southern Rhodesia.

A PRELIMINARY REVIEW.

By W. FLEMING, Stock Adviser.

The future of the cattle industry in Southern Rhodesia is a matter which vitally affects the general welfare of the Colony, and it is one which looms largely in the minds of breeders to-day. It is thought, therefore, that the time is opportune for a preliminary review of the position, more especially as it relates to the system of breeding and management of beef cattle in this Colony at the present time.

Much has been said and written of recent years about the difficulties which the cattle owner has had to face, and these difficulties have been very real. The sudden slump in the beef market in 1921 placed breeders in a very serious position and many had to dispose of their breeding stock at ruinous prices for slaughter purposes. This created a situation which will take time to remedy. It is pleasing to record, however, that during the past year the price of cattle has been on the upward grade, owing mainly to the increasing demand from the Belgian Congo and the firm prices ruling for our prime slaughter stock in the Johannesburg market. The latter, however, can only be a temporary market, as the Union of South Africa is itself or intends to be an exporting country. It is to the everlasting credit of the few breeders who broke new ground by shipping two consignments of live bullocks to England, and, it is pleasing to record, met with a fair amount of success. This is our

goal, and in the writer's opinion the success or otherwise of the cattle industry of this Colony will depend on whether we breed a type of beast suitable for this trade.

That Southern Rhodesia is a cattle country par excellence has been stated authoritatively before, and the writer fully endorses this view. Arable farming will bring its due reward in favourable seasons, but the permanent welfare of the agricultural industry must rest upon the successful development of the cattle industry.

As an industry, cattle breeding has always to compete with a large number of animals marketed, with no regard to their cost of production, such as cast-off dairy cows, worn out breeding animals, and in Rhodesia we have to add to this list the old trek ox and scrub animals. The depressing effect that these kinds of stock have on the price of good slaughter stock in this Colony is well known to most cattle breeders.

Ranching bulls in Rhodesia are as a rule badly neglected, and the conditions under which many of them are kept make it impossible for them to give efficient service. In many cases the proportion of bulls to cows is insufficient. Under ordinary ranching conditions, if less than ·4 per cent. of bulls are used a low percentage of calves may result and the condition of the bulls will suffer.

Bulls imported from overseas cannot be expected to thrive on the veld unless they are given extra attention. The writer has seen bulls imported direct from Great Britain do well under the following conditions: A small camp was well fenced near where the cattle came for water every day, and a shed was erected in the camp, where the bull was fed and watered regularly and stabled at nights. Any cows observed in season were put into the small camp with the bull, and as soon as they had been served were driven back to the herd. In this way a bull will serve three times as many cows in a season as one chasing the herd all day. He will also keep in better condition. The system mentioned was, however, carried out where windmills and storage tanks were erected and camps were so fenced that two or three herds could be under observation from one watering place.

On farms and ranches visited by the writer in Rhodesia the only ones that could show satisfactory results were those on which the bulls were given feed and attention. The average ranch bull is an eyesore. Half starved and stunted, his weedy calves are no credit to himself or their dams.

Efficient bull management is essential to the successful use of pure-bred bulls. Great care should be taken with newly arrived bulls for the first year, as it is courting disaster to let unacclimatised bulls run on tick-infested veld. Wherever possible the bulls should be stabled and should get extra feed and attention and be under careful supervision for the first twelve months. The general practice in Rhodesia seems to be to run all the stock together or in one or two mobs. The reason for this is that division into different grades, sexes, etc., requires either fencing, which the average farmer is not in a position to erect, or a very large farm on which the different herds can be kept apart. Often in the winter months there is only one watering place on the farm, and all the cattle have perforce to be grouped together during that period. This makes fencing a serious problem on many farms and ranches. As a consequence it is very difficult to organise the proper management of breeding stock.

Owing to the difficulty of keeping young heifers away from the bull where farms are not fenced and sub-divided into suitable camps, they often calve down at about two years of age. These cows never grow out properly, and their first calves are generally under-sized, weedy animals. This practice of serving heifers too young is one of the most fertile sources of stunted scrub cattle. Heifers should not be served until they are over two years of age. The general system in this Colony seems to be to get calves all the year round, but the largest number of calves are dropped in November, December and January. The calves born during the winter months are generally the strongest and healthiest. Winter calving, however, should only be practised on good winter veld, as it is a heavy strain on the cows. There are large areas in Southern Rhodesia where winter calving can be carried out successfully. Such a procedure requires that the bulls should be put to the cows for only a part of the year and that a fairly large percentage of bulls be used so that all the cows can be successfully mated in a short time.

Where possible, calves should run continuously with their dams from the time they are dropped until they are weaned. This is by no means the usual practice in Rhodesia. Where the cattle are kraaled the calves are generally separated from their mothers during the day and allowed to drink only at night when the cows come back to the kraals. Many calves on this account are kraaled until they are about six months old, and in a few cases are not even allowed a regular supply of water until they are of that age. Cows which run with their calves are unfortunately very much more difficult to herd than those whose calves are kraaled during the day and which know that they have to return to their calves at nightfall. On this account native herders are prejudiced against herding cows and calves together.

Many bull calves are castrated too late; many breeders do this operation at the time of weaning, when some of the earliest calves are nearly one year old and have had time to breed to the earlier maturing heifer calves. The result is the yearly arrival of a few doubtful in-bred calves from premature dams. It is generally urged that, owing to the fly and the prevalence of screw worm, bulls cannot be safely castrated during the rainy season. This difficulty is largely overcome by the use of Burdizzo pincers. It is advisable to castrate bull calves as early as possible.

A practice which is responsible for the stunting of many calves is the dual purpose system of management carried out by many cattle farmers. It was probably during the slump in the cattle market that the half-dairy half-beef system was introduced into Southern Rhodesia. The cream cheque may have assisted many farmers through a critical period in the cattle industry; but, being unable to purchase good bulls for the improvement of their herds, and owing to their calves suffering from separator fever, their present day young stock are in many cases under-sized, unthrifty animals. This, coupled with the fact that many good breeding cows have been sold for slaughter purposes, must have a detrimental effect on the breeding stock of this Colony.

It is not a wise practice to rear beef calves on cows that are partially milked for dairy purposes.

The chief reason for kraaling of stock is lack of fencing and, in some parts of the country, the prevalence of wild carnivora. The disadvantage of kraaling can, however, hardly be over-stated. Well-bred cattle will only feed freely in the early morning and late afternoon. In this Colony in many cases cattle are kept in until 8 or 9 o'clock in the morning, confined in dusty kraals. In the late afternoon, after a short day's grazing, they are driven back to the kraal over grazing that has been trodden out. The spread of common diseases, such as contagious abortion, ophthalmia, scours and screw worm, through animals being gored, is rendered more easy.

The remedy for kraaling seems to be to exterminate the wild animals and erect a minimum amount of fencing. Under the present economic conditions it is feared that the kraaling system must continue for some time to come.

Cattle breeding in a new country has to contend with many ups and downs, and great credit is due to the pioneer cattle breeders of Southern Rhodesia, who have surmounted many obstacles, such as wild animals, tick-infested veld and many unknown diseases. Despite these obstacles, many breeders have made a success of cattle breeding, and high grade stock are to be seen on their farms and ranches that would compare favourably with the cattle of any other ranching country. These breeders, however, started with a breeding policy, and purchased good bulls of the beef breeds for the improvement of the original stock. They adhered to their one particular breed of bull and eventually obtained good results. Others again do not seem to know what they are breeding for. In the same district it is common to see Shorthorns, Aberdeen Angus, Herefords, Sussex, Devons and South Devons within a very small area, and outwardly each breeder considers his own breed the best and entirely suited to the district. That many breeders are not nearly so confident as may be thought is shown by the disappointment often expressed at the second, third and sometimes fourth cross. It is at this stage that some breeders switch on to another breed, with disastrous results. On several farms and ranches visited in this Colony the writer has seen high grade stock of nearly every beef breed that have done well, and the success of these herds can be attributed to good

management, the use of good strong bulls, feeding when necessary and fencing when possible. There are parts of the country, however, that are not suitable for raising high grade beef animals, and the most satisfactory procedure would be to introduce Afrikander bulls, which it is claimed carry with them a certain amount of hardiness and a slow rate of maturity, which are very desirable under adverse conditions.

To continue the present policy which appears so prevalent, i.e., to strive after quantity at the expense of quality, would undoubtedly be regretted in coming years, however tempting such a course may seem at present. The time is now ripe for a progressive policy which will establish the cattle industry on a sound and permanent footing.

How can this be done? There are many breeders in this Colony who have built up a first-class herd from inferior stock in less than 20 years simply by the use of good bulls. This is the solution. The general use of better bulls is so urgently needed that some scheme of bull distribution must be devised to assist those farmers who are desirous of improving their cattle.

(To be continued.)

The Laboratory Diagnosis of Animal Diseases.

(Revised.)

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

Prevention is better than cure. Failing prevention, the stock breeder's next line of defence is *early detection* of disease. On many occasions in the past stock breeders and others in the Colony have suffered incalculable loss through delay and neglect in the early determination of transmissible diseases.

The veterinary officials can only assist the stock breeder to ward off further losses when the cause of death of an animal or animals has been accurately determined.

With this object the Government has recently supplied every district veterinary surgeon with the necessary microscope, and farmers and stock breeders are urged, when in doubt, to send blood smears to the nearest district veterinary surgeon or to the Department of Veterinary Research at Salisbury.

Special glass slides and wrappers can be had free of charge on application to the Director of Veterinary Research or to the nearest district veterinary surgeon.

I appeal to all stock breeders to study carefully the instructions contained in Mr. Bevan's article and to take the fullest advantage of the assistance that awaits their acceptance.

J. W. Downie,
Minister of Agriculture and Lands.

Many, if not most, of the animal diseases in Southern Rhodesia are caused by minute organisms so small that they can only be seen when magnified many hundreds of times by a powerful microscope. Moreover, the clinical symptoms of these diseases are frequently so much alike that a correct diagnosis can only be made as a result of the microscopic examination of the animal tissues. For example, cases of East Coast Fever have been mistaken for gall-sickness, and preventive measures have been delayed until microscopic examination at the laboratory has proved the error. Again, the correct treatment of a disease can only be applied after an accurate diagnosis has been made. Until then the application of inappropriate remedies may do more harm than good. On the other hand, an early and accurate diagnosis may indicate the correct treatment and result in the saving of the animal.

Necessity for Early Diagnosis.—In this country it is of the utmost importance that the cause of death of every animal should be accurately determined. If cases of infective disease are overlooked, the infection may be distributed far and wide, and incalculable damage may be done before administrative measures can be taken to arrest it. Whenever possible, therefore, preparations should be taken from the sick or dead animal, and should be submitted to the nearest officer of the Veterinary Department, who will make the necessary arrangements for their early examination. For this purpose special glasses and wrappers will be supplied, and all that remains is for the stockman to acquaint himself with the method of preparing, collecting and forwarding the material for examination. The following particulars may assist him:—

Disease Organisms in the Blood.—There are certain common local diseases in which the causal organism is present in the blood, as, for example, East Coast Fever, red-water and gall-sickness of cattle, biliary fever of dogs and horses, trypanosomiasis or tsetse fly disease, and anthrax.

Organisms in the Tissues.—There are others in which the parasite is met with in the diseased tissues. For example, the bacterium which is the cause of quarter-evil is present in the affected muscles and in the fluid which exudes from them, but is rarely present in large numbers

in the blood. Again, the so-called Koch's bodies which are diagnostic of East Coast Fever are present in the spleen or gland for some time before the organism appears in the blood. In tuberculosis the tubercle bacillus is found in the affected glands, lungs, milk and other tissues. In Johne's disease—fortunately rare in this country—the microbe is best found in scrapings of the thickened membrane of the large bowel.

Organisms in Pus and Discharges.—Some diseases characterised by the formation of abscesses, as, for example, glanders, strangles, epizootic lymphangitis of horses and mules, mammitis of cows, etc., are best diagnosed by an examination of the pus and discharges, in which the specific microbe may sometimes be found. The bacillus which causes infectious abortion is met with in the fœtal membranes or after-birth, in the stomach of the fœtus, and in the vaginal discharge of the infected cow; but the best method of determining the presence of the disease is by the examination of the serum of the blood collected in a special manner and submitted to a delicate laboratory test.

Larger Parasites.—There are, of course, several diseases caused by larger parasites which can be seen with the naked eye, but even in such cases it is often desirable that the correct identification of the parasite should be made at the laboratory. For example, certain intestinal worms give rise to disease, but special treatment is based upon the identity of the species of worm. Or again, there are several parasites which give rise to mange or scab, and proper treatment depends upon the species with which the animal is infected. These parasites are so small that they can only be accurately identified when examined under a lens, and for this purpose pieces of wool or hair and scrapings of the skin lesions should be sent to the laboratory.

The Transmitters of Disease.—The diagnosis of certain diseases is sometimes assisted by the recognition of the insects or parasites which transmit them, as, for example, where the tsetse fly is found, trypanosomiasis may be expected; where the bont or tortoise-shell tick is present, sheep may become infected with heartwater; where the blue tick is prevalent, red-water of cattle is to be expected; and where the brown tick is present, East Coast Fever may occur.

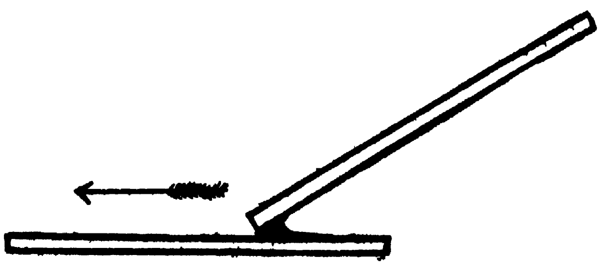
It is often desirable, therefore, to send specimens to the laboratory for identification.

Differential Diagnosis.—Although in certain cases the cause of the sickness or death of an animal appears to be obvious, it is generally advisable to confirm the diagnosis by laboratory examination of specimens.

For example, deaths attributed to gall-sickness have been proved to be due to East Coast Fever, and animals thought to have died of snake bite have proved to have been infected with quarter-evil.

On the other hand, a negative result of examination is sometimes of value, and a correct diagnosis may be arrived at by a process of exclusion.

How to Prepare a Blood Smear.—In preparing smears for purposes of microscopic examination it should be borne in mind that some micro-organisms are as small as one-twenty-five-thousandth part of an inch, and have to be magnified enormously before they can be seen. It is obvious, therefore, that any foreign material such as dust or dirt with which they may be mixed is equally enlarged and may entirely hide the microbes. Also, in order that the microbes can be identified, the material in which they are suspected to be present must be spread out in a very thin layer on the glass. If the material to be examined is spread too thickly, when magnified it appears as a dense impenetrable mass, the individual elements of which cannot be differentiated. Therefore, in making a blood smear one should first obtain two or more perfectly clean pieces of glass, preferably



Method of preparing a blood smear.

The upper glass is pressed along the lower glass, drawing the blood behind it.

the special glass slides issued for the purpose. The ear of the sick or dead animal having been cleaned with a damp cloth and dried, the lower margin should be boldly cut with a pair of scissors or a sharp knife, so that the blood escapes. A small drop about the size of a grain of millet should be collected on the under surface of the short edge of this slide. This edge should then be brought into contact with the surface of the second slide near one end. The blood will then fill the angle between the two slides, as shown in the diagram. The first slide should be held at an angle to the second and should be pushed lightly along it, the blood being drawn behind it in a thin film. This film should be so thin that it will dry almost immediately. When thoroughly dry, *but not before*, the slide may be wrapped in a sheet of smooth clean paper, upon which particulars may be written. Several preparations should be made, but each slide should be wrapped separately.

Mistakes to Avoid.—

Do not use dirty or greasy glasses.
Do not allow the blood to become mixed with grease, dirt, dust or other foreign material.
Do not use too much blood or spread too thickly.
Do not wrap up the smears until dry.
Do not send a drop of wet blood pressed between two glasses. The blood becomes decomposed and the glasses stick together.
Do not wrap in wet, greasy or dirty paper.
Do not forward without particulars for identification.

How to Prepare Smears of Pus, Discharges, etc.—The same procedure as in making a blood smear should be adopted in preparing smears of pus or septic discharges.

In cases of suspected quarter-evil, the affected area should be located by the swelling, which gives a characteristic "crackling" on manipulation. This should be cut into with a sharp knife and a drop of the fluid which escapes should be spread out as in the making of a blood smear.

How to Prepare Tissue Smears.—In some diseases it is desirable that smears should be prepared from some of the internal organs. For example, in cases of East Coast Fever, in which the micro-organism only makes its way into the

red blood cells during the last stages of the disease, an early diagnosis may be arrived at from a *gland smear.* This is made by puncturing one of the large glands of the flank or in front of the shoulder with a perfectly clean large needle from a hypodermic syringe, and spreading out on a slide the gland juice which exudes. On removing the needle it may sometimes be found to contain gland substance, which may be forced out on to and spread along the slide.

In cases where animals are suspected to have died of East Coast Fever, diagnosis may be assisted by the examination of a *spleen smear.* This is prepared by exposing the spleen and cutting through its capsule with a sharp clean knife, and collecting with the sharp corner of a slide a small piece of spleen substance about the size of a small pea. This is rubbed up into a paste against the top of a second slide, and when sufficiently broken down is spread by drawing the one slide over the other with the spleen substance in the angle between them.

How to Forward Blood for the Detection of Infectious Abortion.—Special pipettes and preservative are supplied by the Veterinary Laboratory for this purpose.

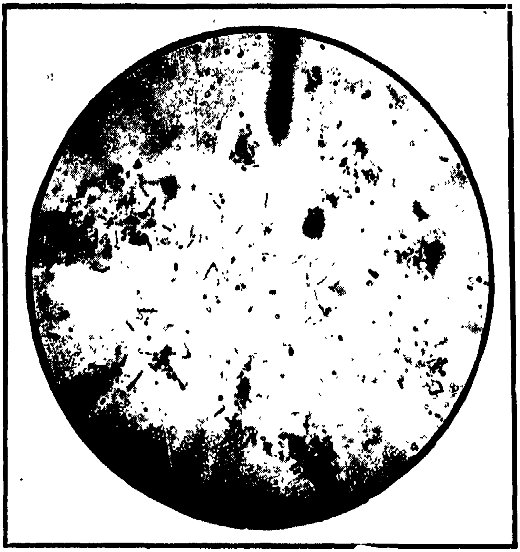
The suspected animal having been secured, its ear should be wiped with a cloth previously soaked in hot water. When dry, a bold incision should be made in the lower margin of the ear, from which the blood should flow freely. The corks having been removed, a small quantity of preservative is drawn by capillarity into the pipette, which is then held horizontally against the ear so that the blood flowing from the wound is drawn freely into it. The amount of preservative should be about one-third the total contents of the pipette. When the blood has clotted, the corks should be re-inserted and a numbered label should be stuck on the pipette in order that the animal from which the blood is taken may be identified.

How to Forward Infective Blood.—In some diseases, e.g., rinderpest, horse-sickness, swine fever, the causal organism is so small that it cannot be seen under the microscope. To prove its presence it is necessary to inoculate susceptible animals with the infective blood. Special tubes with suitable preservative can be obtained from the Veterinary Laboratory in which blood from the sick or dead animal

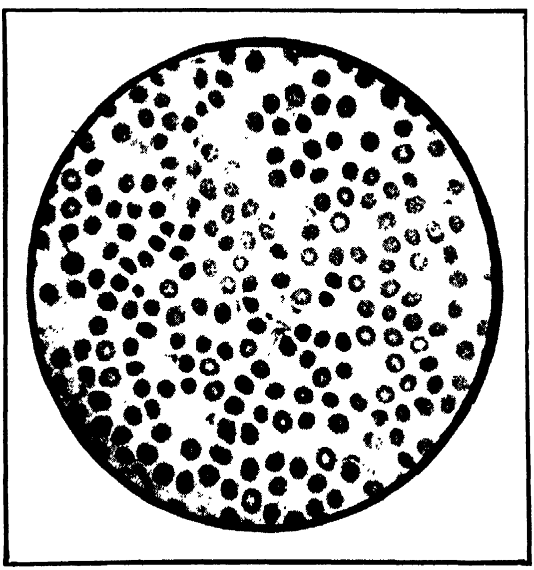
Showing method of using pipette for the diagnosis of infectious abortion.

Micro-photograph of a blood smear badly prepared. The blood has decomposed since taking, and is spread too thickly and contains foreign bodies.

Photograph showing method of preparing a blood smear.



Tissue smear showing quarter-evil bacilli.



Micro-photograph of a well-prepared blood smear, showing the individual blood cells and trypanosomes between them.

can be collected and forwarded. The blood can be obtained from the jugular vein of sick horses, mules and cattle, from the tail of pigs or from the heart of dead animals. The operation is best performed by one who has received previous instruction.

How to Forward Morbid Tissues.—Small portions of diseased tissues, such as tumours, portions of stomach or intestines, organs invaded by worms, e.g., fluke, should be sent in a broad-mouthed bottle containing a fixative such as 10 per cent. formalin solution or 30 per cent. alcohol (say methylated spirit or brandy 1 part, water 2 parts). The pieces of material need not be large and should not be crammed into a narrow-mouthed bottle from which they cannot be removed. The solution in which they are sent should be three times the volume of the tissue and should completely fill the bottle. The greatest care should be taken to completely seal and securely pack the bottles.

How to Forward Specimens of Ticks, Lice, Worms, Snakes, etc.—These may be forwarded for identification in the same solutions as recommended for the preservation of tissues.

How to Forward Samples for the Detection of Poisons.—The following instructions are supplied by the Chief Chemist of the Agricultural Laboratory:—

1. A portion of the contents of the animal's fourth stomach, together with some of the actual stomach wall (especially where there are visible lesions), should be submitted.

2. The sample should be placed in a perfectly clean glass or earthenware jar holding about 2 pints, securely sealed and a label attached on which is stated clearly the name and address of sender, the kind of animal, the date on which the animal died and the date on which the sample was taken.

3. The jar should then be packed so as to avoid damage in transit and despatched to the Chief Veterinary Surgeon, Salisbury.

4. A covering letter should be forwarded to the Chief Veterinary Surgeon, Salisbury, at the same time as the sample, giving—

(a) general details of the symptoms and of the drugs administered (if any) in treatment;

(b) a report upon the *post-mortem* examination;

(c) any further facts which may throw light on the matter.

5. The sample should be forwarded as soon as possible after the death of the animal. Two or three c.c.'s of formalin should be added as a preservative, if available.

List of Diseases and the Specimens which should be sent for Laboratory Diagnosis.

Abortion.—Blood in special pipettes.

Abscess.—Smears of pus.

Actinomycosis.—See "Wooden tongue."

African Coast Fever.—See "East Coast Fever."

Anæmia.—Blood smears.

Anaplasmosis.—Blood smears from living and blood and spleen from dead animals.

Anthrax.—Blood smears.

Arsenical Poisoning.—Blood and spleen smears to exclude other diseases, and stomach contents.

Biliary Fever.—Blood smears.

Black Quarter.—See "Quarter-evil."

Bottle-Jaw of Sheep.—Blood smears and fæces (without preservative).

Contagious Abortion.—See "Abortion."

East Coast Fever.—Blood and gland smears from living animal. Blood, gland and spleen smears from dead animal.

Epizootic Lymphangitis.—Smears of pus and discharge from ulcers.

Fluke.—Worms or piece of infected liver in preservative.

Horse-Sickness.—Blood smears to exclude other diseases. Blood in special preservative.

Infectious Abortion.—Blood in special pipettes.

Lung-Sickness.—Fluid from lungs in special preservative. Portions of diseased lungs in preservative.

Mange.—Hair or wool. Scrapings from skin lesions.

Mammitis.—Milk from affected udder.

Measles.—Infected muscle in preservative.

Necrosis.—Smears from scrapings of lesions.
Pleuro-Pneumonia.—See "Lung-sickness."
Piroplasmosis.—See "Biliary fever."
Quarter-Evil.—Smears of fluid from affected muscles.
Rinderpest.—Blood smears to exclude other diseases. Blood in special preservative.
Ringworm.—Scraping of lesions.
Scab.—See "Mange."
Strangles.—Smears of pus from affected glands (between jaw).
Swine Fever.—Blood in special preservative.
Trypanosomiasis.—Blood smear.
Tsetse Fly Disease.—Blood smears and specimens of flies.
Tuberculosis.—Smears from lesions, portions of diseased tissues (glands, etc.) in preservative. Milk from suspected cows.
Wooden Tongue.—Smears of scrapings from lesions (tongue, jaw, etc.).
Worms.—Specimens in preservative.

How to Forward Specimens.—Specimens prepared as described should be sent to—

The Director of Veterinary Research,
Veterinary Laboratory,
P.O. Box 657,
Salisbury.

Glass slides, pipettes, bottles of special preservatives and wrappers for forwarding can be obtained on application from the laboratory.

Information Required to Assist Diagnosis.—Every specimen sent should be accompanied by a report giving the following particulars:—

Owner's name.
Address.
By whom specimen sent.
Date taken.
Animal—breed, sex, age.
Nature of preparation.
Symptoms before and after deatl

Steps to be Taken when an Animal is Infected with a Destructive Disease.—In terms of Ordinance No. 9, 1904, Part I., paragraph 12.

(1) Every person who shall have in his possession, or under his charge, or shall knowingly have on any land of which he is the proprietor, any animal infected with any destructive disease, shall keep such animal separate from all animals not so infected, and shall immediately give notice to the occupier of all contiguous lands (not being lands situate within the limits of any town or village), and as soon as possible thereafter shall also give notice to the Magistrate, or any Inspector or Sub-Inspector of Stock, or person specially authorised by the Administrator to carry out the provisions of this Ordinance within the district in which such animal is, or to the nearest Justice of the Peace or Native Commissioner, that such animal is so infected, and, on failure to act in the manner directed, shall be liable to a penalty of twenty pounds, or to imprisonment with or without hard labour for any period not exceeding three months in default of payment.

Diseases to which Ordinance Applies.—

(1) African Coast Fever.
Anthrax (or Melziekte).
Foot and Mouth Disease.
Glanders and Farcy.
Heartwater.
Lung-sickness (or contagious pleuro-pneumonia of cattle).
Mange, in horses, mules, donkeys and camels.
Pyæmia (or Epizootic Lymphangitis).
Red-water.
Rinderpest.
Swine Erysipelas.
Swine Fever.
Symptomatic Anthrax (or Sponsziekte) (Quarter-evil).
Tuberculosis.
Trypanosomiasis (vide G.N. No. 86 of 1912).

(2) Scab, in sheep and goats.

(3) Rabies, in dogs and other animals.

Noxious Weeds in Southern Rhodesia.

By F. Eyles, Botanist.

The main provisions of the "Noxious Weed Act, 1926," are as follows:—

"Noxious weeds" means those plants named in the schedule to the Act. They are:—

Burweed.
Mexican poppy.
Dodder.
Prickly pear.

This list may be added to by notice in the *Government Gazette*.

Occupiers of land, holders of mining locations and others defined in the Act as "persons responsible" are required to clear or cause to be cleared any noxious weeds occurring on the land in respect of which they are responsible.

Weed inspectors may be appointed, and they will be authorised to enter any land, enclosed or not, at all reasonable times, to ascertain if noxious weeds are growing thereon.

If a weed inspector finds a noxious weed or weeds he may serve notice in writing on the person responsible, naming the specific weed or weeds present, and require the person responsible to clear such land within a reasonable time stated in the notice.

The following persons are liable to penalties under the Act:—

Any person responsible who fails to comply with a notice received from a weed inspector.

Any person who obstructs a weed inspector in the exercise of his duty.

Fig. I.
Burweed.

Any person who throws a noxious weed or the seed thereof into a river, stream or on to any road or land.

Any person who knowingly sells or offers for sale any plant, seed or grain which is likely to propagate or spread the growth of noxious weeds.

A weed inspector may at all reasonable times enter any premises where any plant, seed or grain is offered for sale, and may take samples thereof; and should he find any seed, etc., likely to propagate noxious weeds, he may order such material to be treated at the expense of the vendor.

Responsible persons in any district may petition the Government to declare any plant a noxious weed in such district.

The weeds scheduled under the "Noxious Weed Act, 1926," are here illustrated and briefly described.

The drawings from which the reproductions were made are the work of Miss Nancy Toft, of the Forestry Office.

BURWEED.

Xanthium spinosum, Linn. Fig. I.

Like most of our troublesome weeds, this is not a native of South Africa, but it is gradually spreading in the country. It is an annual plant reaching 3 ft. or 4 ft. in height. The stem is erect, much branched. The leaves are of peculiar shape (see Fig. I.), having three lobes, the centre one being longest. They are dark green, with distinct veins, and smooth on the top surface, but silvery grey and woolly below. At the base of each leaf is a three-branched yellowish spine. The flowers and the burs are borne in the axils of the leaves. The burs are large and are covered with long, hooked spines (Fig. I. b). By means of these hooks the burs containing seeds attach themselves to the hair or wool of passing animals, or to the clothes of men, and thus the seeds become distributed over the land. The burs become entangled in the hair of goats, the tail and mane of horses and the wool of sheep. Their presence is irritating to the animals and directly and seriously reduces the value of wool.

All burweeds should be rooted out as soon as seen. Cutting them down is of no avail, as they quickly renew

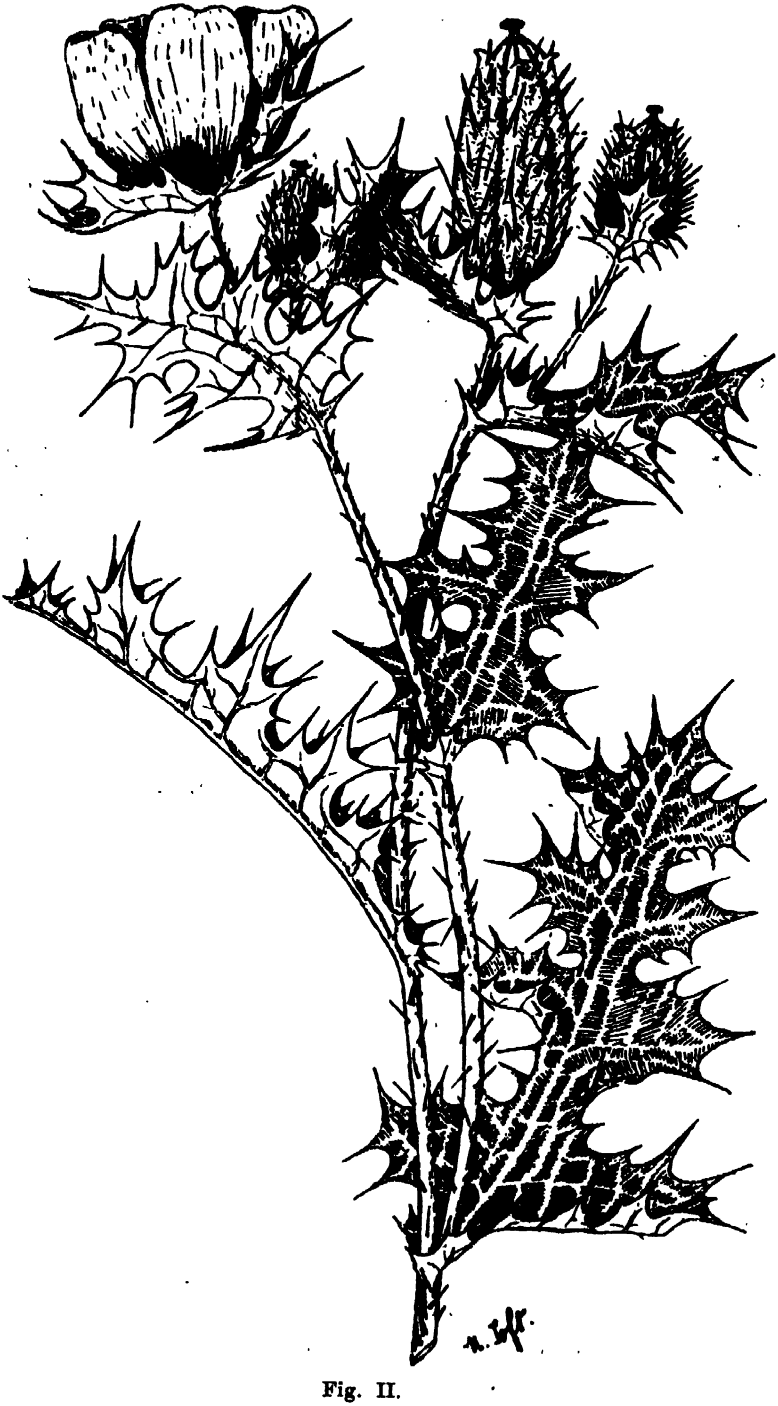


Fig. II.
Mexican Poppy.

growth. Every effort should be made to destroy the weed before it sets seed, and in any case the plants must be dried and burnt.

MEXICAN POPPY.

Angemone Mexicana, Linn. Fig. II.

This weed is a native of Central America, introduced to South Africa many years ago. It is troublesome by roadsides and on waste places, and has long been proscribed as a noxious weed in the south. Its prickly nature makes it objectionable, and it is unpalatable and useless for stock feed. The plant is erect, not usually much branched, and attains 2 or 3 ft. in height. The leaves are narrow, with about six side lobes, and furnished with prickles on both margins and midribs. The flowers are poppy-like, about 2 ins. diameter, pale cream to white in colour. The seed capsule may be as much as 1 in. long, and is covered with prickles.

To eradicate, follow the same method as for burweed.

DODDER.

Fig. III.

The different species of Cuscuta, known as dodders, are very similar to one another in habits and appearance. All are leafless, without green colouring and are complete parasites. They consist of winding, thread-like stems, reddish to yellow in colour, and these stems carry small clusters of little whitish to pink flowers that look almost as if modelled in wax. The dodders are annual and propagate by seeds, of which large quantities are produced. The seeds germinate in the soil, but the roots soon die off, and the young plant must perish unless it has first succeeded in attaching itself to a host. The host is usually a small herbaceous plant, perhaps a veld weed, but often one of the crops, such as lucerne, clover, linseed, etc. Immediately after coming in contact with a suitable host the parasite sends out suckers, which penetrate the skin of the host and absorb nourishment therefrom. It climbs up the host, developing increasing numbers of suckers and more or less enveloping all parts of the plant attacked, which may ultimately die, and in any case suffers from loss of vigour and diminished power of production. That the dodder depends entirely on its host

Fig. III.

Dodder.

for sustenance is proved by the fact that it is not connected with the soil and gets no food thence, and further, by the absence of the green colouring matter used by normal plants to elaborate food from the air.

Infestation with dodder can be largely avoided by the use of pure seed of the crop. Should a patch of, say, linseed be infested by dodder, it should be cut down with plenty of margin, dried and burnt on the spot, a thick layer of straw sprinkled with paraffin being added and spread over the entire patch. A crop infested with dodder must not be fed to stock, for the seeds will pass through the animals and be distributed in the manure. Dodder seed is capable of germinating after lying in the soil five years or more.

The illustration, Fig. III., shows the dodder plant attached to the dead stem of a host which it has killed.

PRICKLY PEAR.

Opuntia (Several Species). Fig. IV.

This plant is so well known it scarcely needs description. It has considerable value as a winter feed for stock, but for this purpose the spineless variety should be adopted. This group of plants is propagated both by seed and by joints broken off, which send out roots if left on the ground.

To destroy it, every part of the plant, branches, roots and all, should be dug out and burnt. Fruits also must be destroyed, otherwise they are eaten by animals and the seeds disseminated.

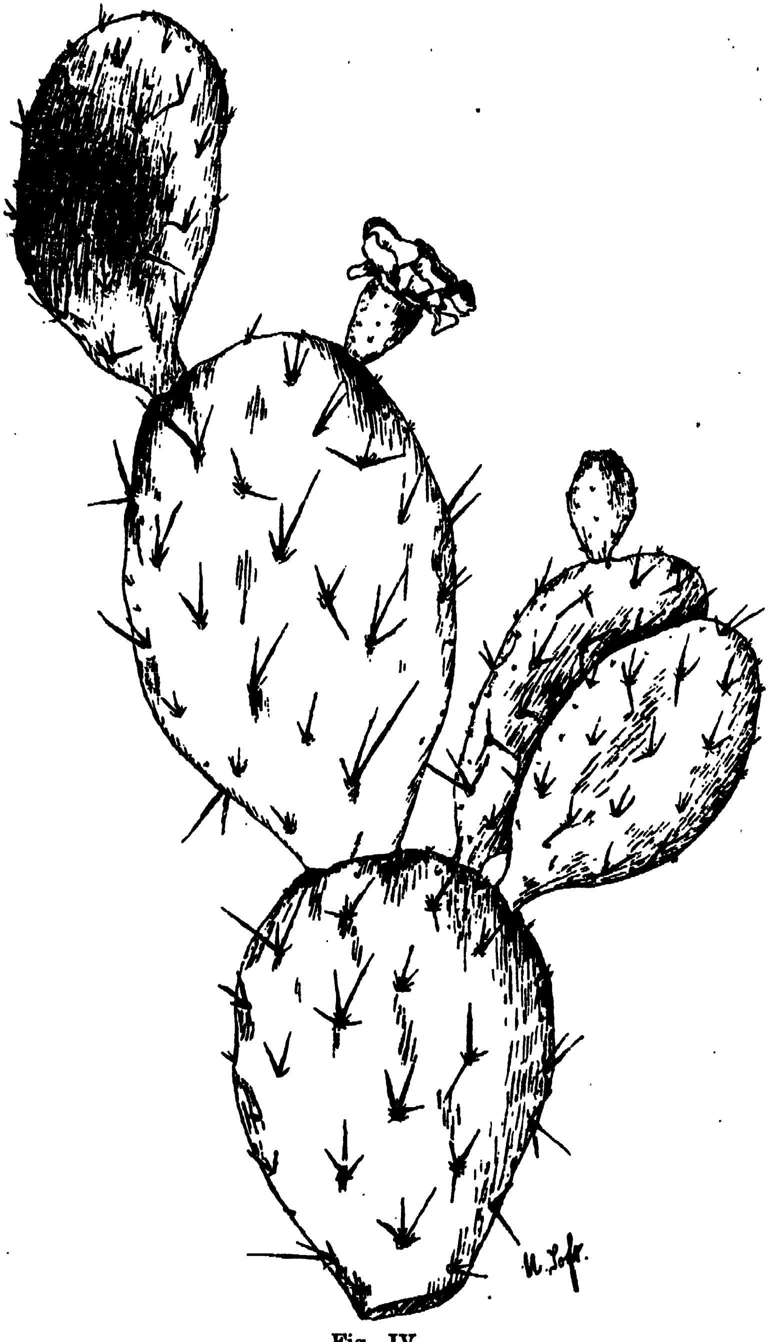


Fig. IV.
Prickly Pear.

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, Director of Veterinary Research, Southern Rhodesia.

"If little labour, little are our gains;
Man's fortunes are according to his pains."
Herrick.

Sir Arnold Theiler may be regarded as the High Priest of Veterinary Science, not only in South Africa, but in other parts of the world where scientific research in veterinary problems plays an all-important part in the progress of the pastoral industry. The material value of his achievements cannot be computed by this generation; it will only be fully appreciated in years to come by those who reap the benefit of his labours. It would be impossible in this short article to deal adequately with all the discoveries he has made and the pioneer work he has performed in the realms of veterinary research. Suffice it to record that in the days when rinderpest threatened to exterminate the cattle of South Africa he and his confreres, Kolle and Turner, elaborated the serum method of dealing with this disease, which has robbed it of its terrors, not only in this continent, but throughout the cattle breeding world. Later, his researches in East Coast Fever demonstrated in record time—that is to say, in a time so short as to constitute a record in the working out of any complex medical problem—the cause of this disease, the manner in which it is transmitted and a practical method of coping with it. If the scientific knowledge of this disease set forth by Koch, Theiler, Lounsbury and Watkins-Pitchford has not resulted in the elimination of it, the blame rests with what has been described as "the human element" rather than with the scientists. Later, Sir Arnold Theiler performed original and

valuable work in connection with red-water, gall-sickness and lamziekte of cattle, horse-sickness of equines, blue tongue and the verminous diseases of sheep, and other maladies of live stock too numerous to mention; foundation work which is recognised throughout the scientific and agricultural world. South Africa has brought forward many great men; Sir Arnold is undoubtedly one of the greatest. Truly he deserves well of the country of his adoption; and yet we read in the local daily Press that Sir Arnold Theiler has now retired from Government service, and in a recent issue of the *Farmers' Weekly* the reasons for his retirement and his intentions for the future are explained. If Sir Arnold had decided to retire altogether from scientific work while still "very young and energetic for 60 years," it would have been a calamity, not only for South Africa, including Rhodesia, but the whole of the civilised world, the progress, prosperity and happiness of which depend so largely upon such as he. But fortunately this is not so. With indomitable courage, enthusiasm and pertinacity he announces his intention of "going overseas for study purposes" and of returning "to devote part of his time to literary work, putting on record some of the information and experience he has acquired during 36 years of hard work in the country of his adoption." Fortunately, therefore, this great scientist will not be lost to us, but, relieved from the burden of administrative work, he will be free to devote his whole time to further research. In his own words, ". . . I have been at the top of the tree long enough to get tired of it, and the older one gets the more idealistic one becomes. . . . All I need are facilities for continuing the only kind of work that matters—research work." The readers of these Notes will fervently hope that Sir Arnold will be given these facilities, if only for the selfish reason that they may derive so much benefit from his efforts.

Onderstepoort.—Not only is Sir Arnold a great scientist, he is pre-eminently a great organiser. The Onderstepoort Laboratory is a lasting memorial to that fact. From small beginnings he has created one of the greatest veterinary organisations in the world. Not only is it a great centre for original and invaluable research in animal pathology, but it has become a huge factory for vaccine production. The following figures derived from a recent official report

indicate the enormous quantity of vaccines and similar products issued from this establishment for the twelve months ended 30th June, 1926:—

Vaccine.	Doses.
Anthrax vaccine	2,388,230
Quarter evil vaccine	305,195
Contagious abortion vaccine	4,957
Red-water and gall-sickness vaccine	8,273
Mallein	7,439
Blue tongue vaccine	1,500,072
Wire worm remedy	14,863,200
Horse-sickness inoculation	4,538

For the year 1926-27 the estimated revenue from this source amounted to £18,000.

Last, but not least, a school for the education of young men in the science and art of veterinary surgery and medicine has been formed, and already highly-trained young South Africans are emerging from the Onderstepoort Veterinary College. One of them, a Rhodesian, will, by the time these notes are published, have joined up as assistant to the Veterinary Research Department of this Colony, where he will have every opportunity of proving the value of his education.

Research.—Notwithstanding the value and importance of Onderstepoort as a commercial concern, the creator of the institution still attaches primary importance to research. He says:—

"The best arrangement under the new amalgamation scheme would be to cut off the research laboratories as a separate unit, independent of vaccine production and diagnostic work, and leave the teaching and research staff free to devote their whole energies to their legitimate labours. Indeed, the ideal arrangement would be to convert the academic and research portion of Onderstepoort into a separate institution and endow it with a capital sum, the interest of which would be ear-marked wholly for scientific work and remain independent of annual fluctuations of departmental estimates; to be, in fact, an institution controlled wholly by scientific men and free as far as possible from such chronic irritants as Auditor Generals, Public Service

Commissioners, Ministers and Treasury control. Any good work I have been able to do for the country has been done in spite of the creaking machinery of Government, and I only hope that my successor will be as successful in eradicating non-scientific interference as I have been. The best scientific research institutions in the world to-day are those which have large private endowments, or in which State-aid is given in the form of a block grant over which the State itself exercises very little detailed control."

When, however, one studies the photographs which have appeared in our contemporaries of the magnificent buildings and equipments at Onderstepoort, and when one realises that for the year 1926-27 the sum of £95,327 was allocated to the Department of Veterinary Education and Research, one feels that the Union Governments, past and present, have not been ungenerous or niggardly in their support. Perhaps, again, the credit must be given to Sir Arnold for his persuasive and powerful personality.

Research by some is regarded as a gamble; by others as an investment. It is true that the majority of research workers pass a lifetime working slowly, painfully and patiently and without achieving any sensational result. Their efforts, however, are not in vain; often they lead up to most important discoveries. But among the many there are a few who succeed, the value of whose discoveries cannot be computed. Let us, for an example, quote in the words of Woods Hutchinson the story of the discovery of the aniline dyes by " . . . a brilliant and determined little English chemist, William Perkin, in a course of a tireless attempt to extract—or rather build up—a synthetic or manufactured quinine out of coal tar. He had been working doggedly for nearly two years without success, and was beginning to feel discouraged, when one day he went out to luncheon leaving in a glass beaker some aniline oil with which he had been working. When he came back the oil had thickened and stuck to the bottom of the beaker, and to clean it off he poured in some alcohol. Instantly it struck a brilliant mauve or orchid colour. His keen brain saw new possibilities at once. He switched from the trail of the bitter drug to that of the beautiful dye, and inside of a few years had made a comfortable fortune out of those geraniums of

the gas works, those crocuses of the coke ovens, now familiar as the coal tar or aniline dyes."

Few of the readers of these notes take any particular interest in geraniums or crocuses, and fewer scientists hope to expect to derive a "comfortable fortune" out of their discoveries. Yet the fact remains that this discovery of the little English chemist, William Perkin, has resulted in a countless number of coal tar products, drugs, dyes, chemicals and perfumes, the value of which cannot be assayed.

This example again recalls the poor but enthusiastic young scientist, Louis Pasteur, working with his crystals. How little could it have been foreseen that he, rich in nothing but his incomparable genius, was on the verge of a discovery which would, in the long last, revolutionise, not only commerce, but human life itself! Even the great Huxley, when in his lecture to the Royal Society he said, "Pasteur's discoveries alone would suffice to cover the war indemnity of five milliards paid by France to Germany in 1870," ridiculously under-estimated the value of his achievements.

At the risk of labouring the point one is tempted to quote another example in Pasteur's own words, "Do you know when it first saw the light, this electric telegraph, one of the most marvellous applications of modern science? It was in that memorable year 1882. Oersted, a Danish physicist, held in his hands a piece of copper wire, joined by its extremities to the two poles of a volta pile. On his table was a magnetised needle on its pivot, and he suddenly saw (by chance, you will say; but chance only favours the mind which is prepared) the needle move and take up a position quite different to the one assigned to it by terrestrial magnetism. A wire carrying an electric current deviates a magnetised needle from its position. That, gentlemen, was the birth of the modern telegraph." And, in the light of our present knowledge, we might add, the fore-runner of the wireless beam and television.

The Eleventh and Twelfth Reports.—All this leads us to the introduction of the recently published eleventh and twelfth reports of the Director of Veterinary Education and Research of the Union of South Africa, two enormous

volumes containing such a collection of facts and figures that it would take most of us many weeks to read, many months to mark, many years to learn and a lifetime to digest them. Much of the information contained in the reports would appear to be of purely theoretical importance. But who can say where theory ends and practice begins? "Without theory, practice is but routine born of habit. Theory alone can bring forth and develop the spirit of invention. It is to you specially that it will belong not to share the opinion of those other minds who disdain everything in science which has not an immediate application." (Pasteur.) There remains, however, a large proportion of these volumes devoted to essentially practical considerations. The researches of Cowdry in heart-water of sheep will open up a field of investigation into similar diseases affecting man and animals. The "Report on the Transmission of Nagana in the Ntabanana and Mhlatuze Settlements, Zululand," by Bedford, includes many observations of local—that is, Rhodesian—interest. The "Check List of the Muscidæ and Œstridæ which cause Myiasis in Man and Animals in South Africa," by the same painstaking author, includes many old Rhodesian friends (sic!), including *Chrysomyia bezziana*, Villeneuve, which is the scientific name for the blue bottle fly responsible for the screw worm of local cattle. We have heard it referred to by less dignified if more euphonious appellations. Mr. Bedford says, "Larvæ of this species, known as the 'old world screw worm fly,' were taken from the foot of a horse and from around the anus of a bovine at Ntabanana, Zululand, in January, 1923. They were collected by Mr. H. H. Curson and determined by Major W. S. Patton." If Mr. Curson would visit this country he could collect with the greatest ease a truck-load of these flies and their maggots, which would keep Major Patton busy for a very long time. He might also, to carry his investigation further, determine where these flies go to in the winter time, and perhaps devise a method of eliminating them. That other fly, locally known as the "maggot fly," which attacks our dogs and other people's babies—and it has even been known to favour and cause considerable annoyance to leading and corpulent Rhodesian citizens—is referred to as *Cordylobia anthrophaga*, Grunberg. According to the observations of Blacklock and Thompson, this fly is associated with wild

rats, which appear to be the main reservoir of the infection in nature, so that rats should be eradicated as far as possible from houses. And because the fly deposits its eggs on clothes lying exposed to the sun, underclothes and bed linen should be carefully ironed after washing and drying and then stored away from the risk of further infection. But this by the way. Let us return to the reports.

E. M. Robinson discusses "Serological Investigations into some Diseases of Domesticated Animals in South Africa caused by Trypanosomes," which may have an important practical value in connection with the diseases caused by the tsetse fly in this country. C. P. Neser tells us of the condition of the blood met with in animals suffering from horse-sickness; Werner Steck discourses upon a "Volvulus in a Calf due to Aplasia of the Mesentery," and Jean G. Baer adds "Contributions to the Helminth Fauna of South Africa." J. P. van Zyl contributes "Notes on the Decomposition of Diluted Polysulphide Dips," and H. O. Monning describes "The Anatomy and Life History of the Fowl Tape Worm." P. L. le Roux gives a detailed description of the "Helminths Collected from the Domestic Fowl and the Domestic Pigeon in Natal," and H. O. Monning, again, contributes "Helminthological Notes" and "Life Histories of Trichostrongylus instabilis and T. rugatus of Sheep in South Africa." G. de Kock and J. B. Quinlan dilate upon "The Appearance of Gonderia ovis in the Blood of Splenectomised Sheep," and "Splenectomy in Domesticated Animals and its Sequelæ, with Special Reference to Anaplasmosis in Sheep," a disease which, notwithstanding their scepticism, was described by the writer of these notes in a Government Bulletin No. 114, April, 1912. Marguerite Henrichi deals with "The Chlorophyll Content of Grasses in Bechuanaland," and D. T. Mitchell discusses "The Toxic Effects of Urginea macrocentra (Baker) on Ruminants"; while M. W. Henning writes on "Krimpsiekte," a disease which appears annually among animals in the most arid parts of the Cape Province, characterised by symptoms indicating an affection of the muscular and nervous systems. Marguerite Henrichi, again, presents a "Preliminary Report upon the occurrence of Hydrocyanic Acid in the Grasses of Bechuanaland," and P. R. Viljoen recounts the difficulties which have been encountered and surmounted in the discovery

of "An Improved Method of Inoculation against Black Quarter in South Africa." J. B. Quinlan describes a "Necrobacillus in Equines" which resembles that met with by the writer in donkeys at the Surprise Mine, Selukwe, in 1906; and, once again, Marguerite Henrichi contributes "Physiological Plant Studies in South Africa," in two parts. In Part II. of the report Sir Arnold Theiler, in collaboration with Viljoen, Green, du Toit and Robinson, presents an exhaustive study on "Lamziekte (Parabotulism) in Cattle in South Africa," a study running into 1,361 pages.

This brief and superficial summary of work, instigated and accomplished by the Director of Veterinary Education and Research and his staff, emphasises the point made at the commencement of these notes, namely, the great and irreparable loss which Rhodesia and the Union of South Africa have sustained in the retirement of Sir Arnold Theiler, the moving spirit in all these researches.

Tobacco Baling Boxes.

By B. G. Gundry, Irrigation Branch.

The accompanying drawing illustrates an improved type of baling box as now being used at the Rhodesia Tobacco Warehouse and Export Company, Salisbury. This type of box is made, for convenience of handling, in two sections, an upper half or guide box and a lower half, the baling box proper.

As will be seen from the illustration, the two sections are identical, each one consisting of a rectangular box or frame 34 ins. long x 24 ins. wide x 20 ins. deep (inside measurement) with neither top nor bottom. They are constructed of $1\frac{1}{2}$ ins. deal planks, planed smooth on the inside and supported by 3 ins. x 2 ins. battens, which are mitred or bevelled to 45° at either end.

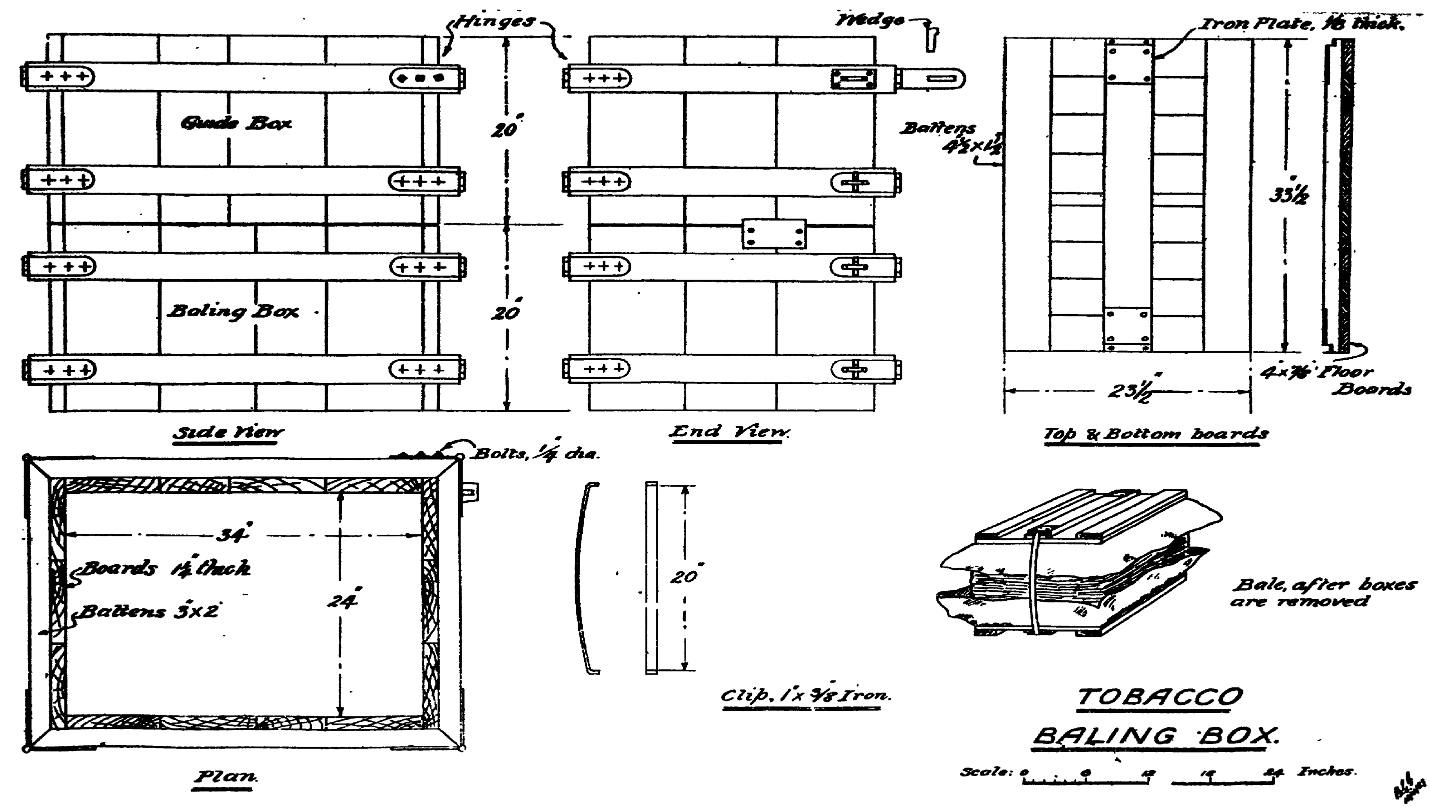
The four sides of the box are held together by means of iron hinges attached to the battens at three corners, and at the fourth corner by a form of hasp and staple fastening, which, when secured by a wedge, holds the whole box rigid.

The lower box may be fitted with strips of wood or metal projecting about $\frac{1}{2}$ in. above the top edge to keep the upper box in register while being filled. The top and bottom boards or covers, which are also identical, are made $\frac{1}{2}$ in. smaller each way than the boxes, and are therefore $33\frac{1}{2}$ ins. long x $23\frac{1}{2}$ ins. wide.

These are made from 4 ins. x 1 in. flooring boards, supported by three battens of $4\frac{1}{2}$ ins. x $1\frac{1}{2}$ ins. deal. The centre batten is checked out at either end for half its thickness and $\frac{3}{4}$ in. back to make room for the ends of the clip, the timber at this point being protected by an iron wearing plate $\frac{1}{8}$ in. thick.

Two clips made from 1 in. x $\frac{3}{8}$ in. iron, bent to the form shown, complete the outfit.

In operation, the lower cover with the hessian folded round it is placed face upwards on the press table or on a separate handling board, and the lower box is placed over it.


Hinges
Wedge
Iron Plate, 1/8 thick.
Guide Box
Baling Box
20"
20"
Battens 4 1/2 x 1 1/2
33 1/2"
23 1/2"
4 x 7/8 Floor Boards
Side View
End View
Top & Bottom boards
Bolts, 1/4" dia.
34"
24"
Boards 1 1/4" thick
Battens 3 x 2
20"
Clip, 1" x 3/8" Iron.
Bale, after boxes are removed
Plan.
TOBACCO
BALING BOX.
Scale: 0 6 12 18 24 Inches.

The leaf is then packed and trodden down until the box is full, when the upper box is placed in position on the lower one, and the packing continued until the required weight of leaf has been inserted. The box is now covered with the second piece of hessian, the top cover placed over it and the bale is ready for pressing.

When the leaf is sufficiently compressed the boxes are opened and removed, and the bale is secured by means of the metal clips. The bale, which should now appear as shown in the small perspective sketch, may be released from the press and put aside to set. The hessian should be sewn up before the clips or holding irons are removed from the ends of the bale. As the bale will take approximately 10 to 12 hours to set, it will be noted that the number of covers and clips required will depend on the number of bales it is required to produce per diem, and the rate at which they can be dealt with by the press.

Where a large output is required and the pressing takes some time, it would be an advantage to have two pairs of boxes with the requisite number of covers, so that one box is being filled while the other is being pressed.

It may be observed that a slight economy in the cost of the boxes might be effected by substituting plain iron corner clamps in place of the hinges at the corner opposite the fastenings. The clips might with advantage be made of slightly heavier section, and the writer would suggest iron of $1\frac{1}{4}$ ins. x $\frac{3}{8}$ in. as being more suitable. The quantities of material required for the construction of one pair of boxes, two covers and two clips are as follows:—

Item.	Number.	Section.	Length.
Boxes (one pair)—			
Deals...	**4**	**9 ins. x $1\frac{1}{2}$ ins.**	**12 ft.**
,, ...	**4**	**3 ins. x 2 ins.**	**12 ft.**
Hinges	**12**	**Specially made**	**...**
Fastenings	**4**	**Specially made**	**...**
Screws and bolts ...	**...**	**As required**	**...**
Covers (one pair)—			
Flooring	**3**	**4 ins. x 1 in.**	**12 ft.**
Deals...	**2**	**$4\frac{1}{2}$ ins. x $1\frac{1}{2}$ ins.**	**9 ft.**
Sheet iron	**1**	**$4\frac{1}{2}$ ins. x $\frac{1}{8}$ in.**	**20 ins.**
Screws	**...**	**As required**	
Two clips (iron)	**1**	**$1\frac{1}{4}$ ins. x $\frac{3}{8}$ in.**	**44 ins.**

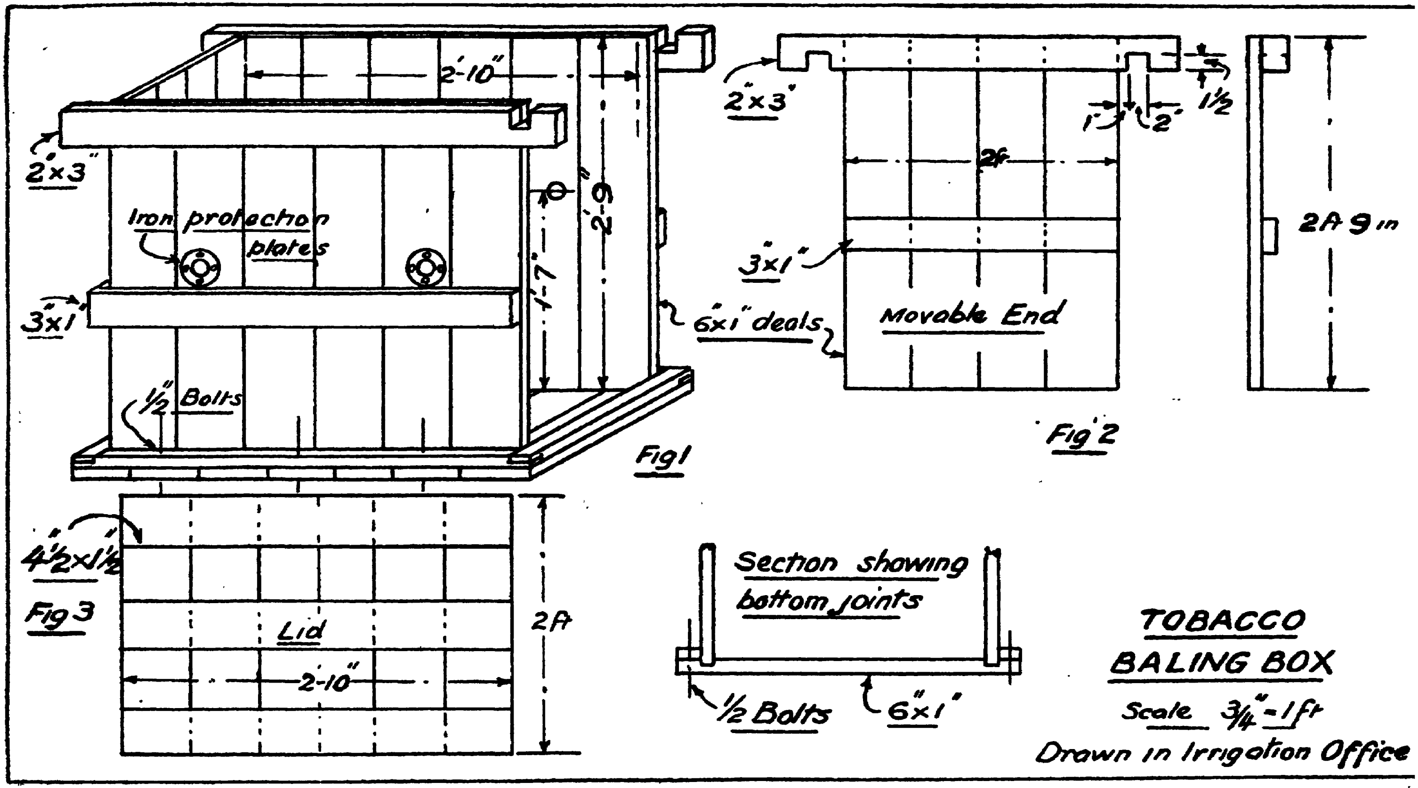
For the benefit of those farmers who, having only a small quantity of tobacco to deal with, may require to make a somewhat cheaper type of box, a drawing of such, together with a brief description by Mr. C. A. Kelsey Harvey, the manager of the Tobacco Experiment Station, is reprinted here from the *Agricultural Journal* of May, 1926:—

"A suitable size baling box can be made of flooring boards or good packing case wood not less than $\frac{7}{8}$ in. thickness.

"The inside measurements of the box should be: Length, 2 ft. 10 ins.; width, 2 ft.; depth, 2 ft. 10 ins.

"The base is made of similar material, two sides and one end of the box being firmly attached thereto by means of bolts or screws; the other end must be detachable to enable the bale of tobacco to be slipped out when ready for sewing up. A strong top must also be made to fit inside the box so that the tobacco can be pressed down to the required size bale, viz., 2 ft. 10 ins. x 2 ft. x 1 ft. 4 ins.

"In each of the two sides two holes should be bored 7 ins. from each end and 1 ft. 6 ins. from the bottom of the box, large enough for iron bars or pipes to be inserted across the box, the purpose of these being to hold the cover or top of the box firmly in position after the pressing jack has been removed and the bale left to set."


2"x3"
2'-10"
2'-9"
1'-7"
Iron protection plates
3"x1"
1/2" Bolts
6"x1" deals
Fig 1
2"x3"
1"
2"
1 1/2
2ft
3"x1"
Movable End
2ft 9in
Fig 2
4 1/2"x1 1/2"
Fig 3
Lid
2'-10"
2ft
Section showing bottom joints
1/2 Bolts
6"x1"
TOBACCO
BALING BOX
Scale 3/4"=1ft
Drawn in Irrigation Office

Bee-Keeping in Rhodesia.

HANDLING A SWARM.

By T. SAVORY.

It might be well first of all to give the correct meaning of the words "swarms" and "colonies." A large collection of bees is said to be a swarm when it has left its old home in charge either of the old queen or a new one. The bees cluster in a hanging bunch, generally from some branch of a tree, while the scouts are looking for a new home. When the swarm has entered into and taken due possession of its new quarters it ceases to be called a "swarm," and is known generally as a "colony." With normal rains and summer weather, swarming may be expected any time after the last week in March, late rains tending to delay the dates. It therefore behoves the bee-keeper to have everything ready for his operations. His first item is to decide upon the increase of hives required, and, for example, let it be supposed that from the two or three experimental hives of the present season it is decided to increase them to twelve. For this number the following should be ready for use:—

6 hive stands, to take two on each;

12 bottom boards or hive floors;

12 brood chambers, each complete with 10 frames, two dummy frames, one quilt (old canvas or flour bags do well), entrance closer and a small strip of queen excluder;

12 lids;

12 roofs.

The foregoing is the very least that should be prepared and ready for immediate use when required. All outside wood should have three coats of paint, except the stand, which should have a coat of tar, applied hot.

It would be much better if the apiculturist also prepared in readiness one shallow frame crate to act as a double brood chamber if and when required, also one for extracted honey, one for comb sections and one ventilating lid (see earlier notes) to each of the twelve hives. All these are essential as soon as the honey flow starts; and if each hive and its component parts have the numbers 1 to 12 plainly stencilled on them, this will save a lot of trouble later on when dealing with each portion. These items form the complete outfit, and though they may not all be required at once for actual use, the fact that they are ready and known to fit will make it much easier to deal with them when really required.

The next action is to choose the hive sites. Root out all grass, etc., to about 12 ins. on each side, placing thin flat stones ready for the legs to stand upon, which latter should rest, if possible, in half of a one-gallon drum, cut to about 4 ins. in depth, to keep ants away. All is now ready to hive any swarm that may be available.

To hive the swarm the following articles should be ready at hand: A good veil, smoker and a pair of gloves, a fairly large kitchen spoon, a bee brush, one or two cloths of old linen a trifle larger than the brood chamber surface, any old square dish, about 12 to 14 ins. wide and 4 to 6 ins. deep, to be used for brushing clusters into on occasions (one of the wife's bread baking pans suits capitally), a thin plank about 4 ft. long by the width of the hive covered by any old white calico remnant to be used as a platform for easy access to the hive. The usefulness of this will be seen should a swarm or any part of one have happened to escape, or when a portion only has been hived, for once the queen is inside, all the other bees will run up it like sheep following their leader. Add to these items a carrier made of light wood, say, two pieces of 1½ ins. by 3 ins., 4 ft. 6 ins. long, boarded over by any light plank a little wider than a hive; this will always be useful to place the newly swarmed hive upon at sundown to carry it direct to the apiary. It is also well to include a small table, a long knife, scissors and some

narrow tape for dealing with any combs that may be found ready built if work has already begun. And, finally, provide the main article, i.e., a trap hive, which is simply a replica of the brood chamber without the usual floor board or entrance, but resting on a loose bottom, which can be fastened with string or light cord, also a lid to act as a cover.

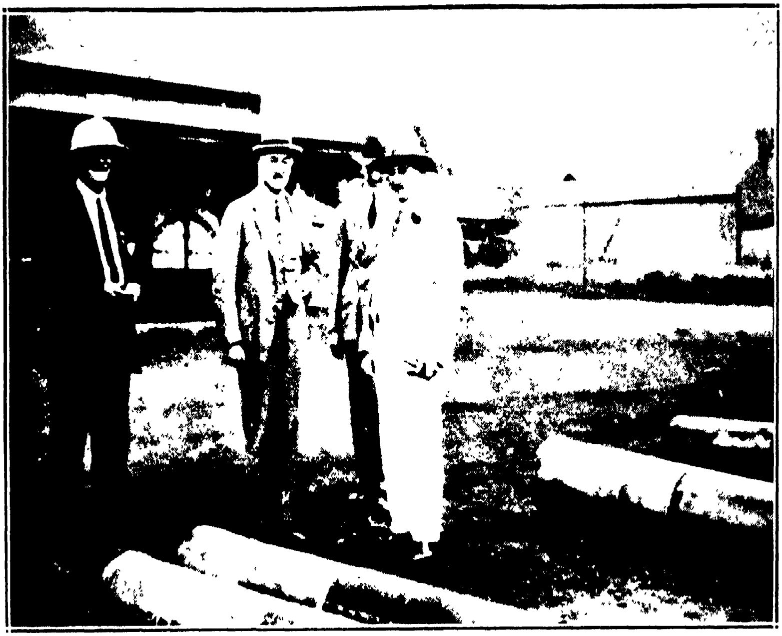
The hiving of a swarm is quite a simple matter after the first trial. The first notification of the approach of a swarm will be the appearance of a few scouts flying about one particular spot, generally from 10 to 11 a.m., followed by a few others during the course of the morning. According to the way in which they act it can usually be known if they are in earnest or only a few roving insects in search of fresh sources of food. Should they remain in one place after a short while and bustle in and out of any box or receptacle lying about, it may be accepted that they are searching for a new home; while if some go inside and start closing up any holes with propolis (or bee glue), the fact may be taken for certain. In this case place in the box, trap or hive chosen a couple or more dummy frames and fill it up with frames of full foundation and cover up the lid again. If the latter can be wedged open very slightly at one corner, just enough for bees to enter, it will facilitate the swarming when it does occur. Have all appliances ready at hand and await events. The main body should appear as a rule about 4 p.m., when with a steady flight the whole swarm of from ten to forty thousand bees will swoop down close to the place chosen, after hovering in the air above it for a few seconds, and within a few minutes will have entered the receptacle chosen. If in a hive, all the better, for in that case, after quickly placing a quilt over the top of the frames and replacing the lid (or even letting this wait until later on), nothing more need be done at present. At sundown place a strip of queen excluding zinc over the entrance, secured in its place by the two short entrance closers partly in position, cord up the lid, brood chamber and the bottom floor in one piece to prevent opening out, place it on the carrier, carry it down gently to its chosen site in the apiary, undo the cord, put on the roof, which can be weighted down with stones, and leave it as a properly hived

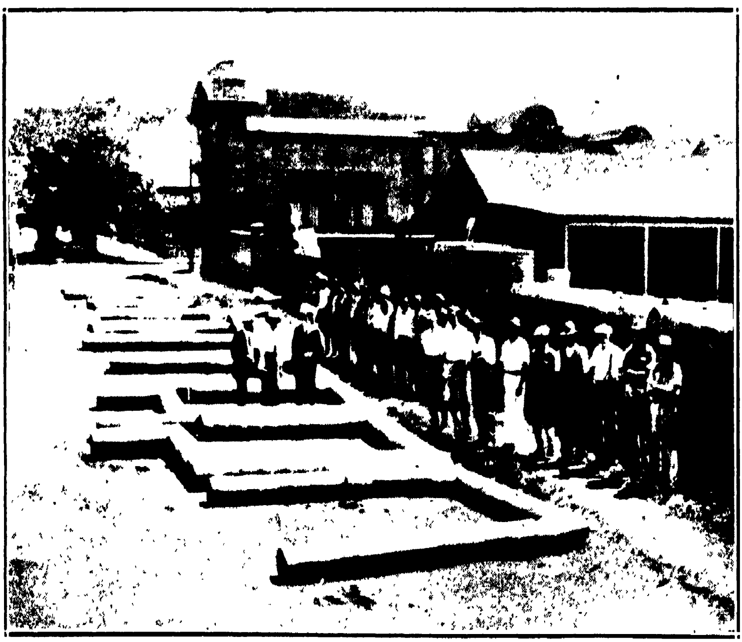
colony. If, however, the scouts indicate that a trap box will be chosen, prepare this by placing two dummy frames in it and four or five proper ones fitted with full sheets of foundation. Should this be in due course occupied, as soon as the bees have settled down quietly, say in an hour's time or less, place the trap box gently on a table level with the hive chosen, lift up the lid of the trap gently, and should there be any bees clustering on it, as will probably be the case, jerk them off into the hive into the spaces between the frames, or brush them off with the bee brush. This done, remove the frames placed in the trap one by one gently and carefully, drop each into its place in the hive, when it will probably be found that the whole swarm has been successfully transferred. Then as quickly as possible, though still gently, fill up the hive with full foundation frames, either to the full number of ten or a lesser quantity with more dummies, according to the size of the swarm, cover the tops of the frames with a quilt, then put the lid on and tie up all as one piece for the safer moving later on, with the strip of excluder on the entrance as before, and leave it for a similar after treatment. Should neither of the afore-named places have been chosen by the swarm, but an old cupboard, box or other receptacle, open it quietly, and, having a hive ready as described, take the pan or dish referred to, and, holding it underneath the cluster, brush the bees off into the pan or dish, emptying the mass directly into the prepared hive, repeating this until all or the greater portion of the swarm has been so treated. Now fill up with frames as before directed, though in this latter case of handling it is better to fix on the excluder strip before shifting the bees.

As a rule these volunteer swarms are quite safe, tame and easy to handle, for the simple reason that before leaving their nest, and knowing they are going to a strange unprepared home that may take them from twelve hours to two or even three days to settle in, they fill themselves with honey, in which condition (like many of a nobler creation) they are happy and good tempered and do not sting. As, however, it sometimes happens that a swarm may have been on its cluster a couple of days or more through stress of weather, etc., or by having been driven from its home by natives, and is therefore empty of food supplies, it is never really

safe to risk handling a swarm without a veil, though a smoker is not so much required.

In this operation of hiving swarms care should always be taken to be sure that there are no open spaces left in the brood chamber, and if enough frames to fill it are not available, then fill it with dummy ones. So sure as there is any space left, so sure will the bees build their combs on to the quilt, which will mean that when opening out the brood chamber later on, even if only by a few hours, the tearing off of the quilt from the comb will not only enrage the inmates and probably bring them out in thousands, but the comb is as likely as not to fall into the bottom of the chamber and run the risk of blocking up the entrance and suffocating all inside; while if no quilt is used the comb will be built on to the lid, which is a much worse condition. The writer has experienced both cases, but never again. Ten to twenty dummy frames laid by for use are of much real value.





H.E. the Governor inspecting tobacco barn flues at Messrs. Mitchell and Liddle's works, Salisbury.

Flues for Tobacco Barns.

We reproduce on the opposite page two photographs taken on the occasion of the visit of His Excellency the Governor on the 25th March to Messrs. Mitchell & Liddle's works in Manica Road, Salisbury. His Excellency takes a keen interest in the development of the tobacco growing industry in this Colony, and his visit to Messrs. Mitchell and Liddle's premises was made for the purpose of seeing for himself the process of making flues for tobacco curing barns.

The demand for flues this year has been phenomenal, and the firm, as well as others who specialise in this class of work, have been hard put to it to meet requirements. One of the illustrations shows sets of complete flues assembled ready for despatch to the purchasers, whose requisitions have come from all parts of the Colony. According to the orders placed with Messrs. Mitchell & Liddle, the most popular flue is that used with the double furnace, although many have been supplied for the single furnace barn and those fitted with the Johnson furnace, of which particulars and an illustration were given in the issue of this Journal for October, 1926.

His Excellency inspected the whole process of flue making and evinced very keen interest in the work, his visit occupying the greater part of the morning.

Movements of New Settlers.

New Arrivals.—The following new settlers arrived in the Colony during the month of March, 1927:—

A. Weir.—Arrived from Union on 2nd March, and is viewing land.

F. A. Arnold.—Arrived from Kenya on 3rd March on tour of inspection.

G. Bligh-Wall.—Arrived from England on 4th March on tour of inspection.

Mr. and Mrs. B. S. S. Courtney.—Arrived from England on 4th March, and have been accommodated on Mr. P. H. Gresson's farm Sebastopol, Salisbury.

B. H. Homersham.—Arrived from Union on 7th March, and is now with Col. Hodgson on Dormervale, Marandellas.

A. D. Griffin.—Arrived from New Zealand on 10th March, and has joined Mr. G. F. Rawson, Trelawney.

E. G. Haig.—Arrived from England on 11th March, and joined Mr. H. H. D. Christian, Arcturus, for a period of training on farm The Meadows.

R. Moore.—Arrived from England on 16th March, and has joined Mr. J. G. Duncan on farm Warwick, Marandellas.

R. W. O. Thurburn and R. T. Barton.—Arrived from England on 16th March, and have been viewing land in various districts.

L. Atkinson.—Arrived from England on 18th March, and proceeded to Mr. C. C. Macarthur's farm Komani, Salisbury district, for training.

C. F. Bowman.—Arrived from England on 18th March, and proceeded for a period of training to Mr. A. C. Henderson, Great "B," Mazoe.

Capt. and Mrs. C. T. C. Taylor.—Arrived from England on 18th March, and have been accommodated for training on Gwebi Government farm.

Mr. and Mrs. A. M. Button.—Arrived from England on 18th March, and have since joined Mr. B. J. Ingle for training on farm Hillview, Lalapanzi.

D. W. Marriott.—Arrived from England on 18th March, and proceeded to Mr. G. Seagar, Marandellas.

W. T. R. Wingfield.—Arrived from England on 18th March, and joined Mr. A. Brown on M'sorodoni, Concession.

C. E. Fieldsend.—Arrived from England on 18th March, and proceeded for training to Messrs. Larter and Watkins, Banket.

D. R. Methven.—Arrived from England on 18th March, and proceeded for training to Mr. W. H. Swain, Lydiate.

E. McCallum.—Arrived from England on 18th March, and is now on Stapleford farm, Salisbury.

G. T. Levinge.—Arrived from England on 25th March, and joined Mr. H. T. Lay, Headlands.

J. Holm.—Arrived from England on 25th March, and is now with Mr. V. H. Brisley, Umvukwes.

J. R. Bedford.—Arrived from England on 27th March, and has since joined Mr. R. I. Keys, Marandellas.

R. Raynor.—Arrived from England recently, and stayed with Mr. M. J. Murray, Gwelo.

G. M. Hayes.—Arrived from England with his son on 28th March on tour of inspection.

Mr. and Mrs. S. M. de Groot.—Arrived from England on 29th March, with son and daughter, and have been accommodated temporarily on Mr. T. R. Ward's farm Chitora, Rusape.

G. Revill.—Arrived from England on 30th March, and joined Mr. E. Dawson, Pembi, Concession.

Settlers who have taken up Land.—Mr. and Mrs. E. F. Loomes.—Have acquired portion of Glen Lorne Estate, near Salisbury.

Mr. and Mrs. R. A. Comyn.—Have acquired a Crown land farm in the Beatrice area.

F. J. C. Bloomfield.—Has acquired Wragley farm, Gutu district.

T. F. Lyle.—Has acquired farm Arcadia, east of Banket Junction.

Capt. H. P. D. Dimmock.—Has acquired farm Erdington, near Fort Victoria.

L. D. Morse.—Has acquired farm Exwick, Hartley district.

E. V. Tucker.—Has acquired farm Poole, Hartley district.

H. B. Hazell, Messrs. Noble Bros., Capt. E. Lattey.—Have acquired Crown land in the Lomagundi district.

Capt. F. J. T. Frost.—Has acquired farm Wells, Marandellas district.

W. Torrance.—Has acquired farm Burnhouse, Salisbury district.

H. E. Hockey.—Has acquired Gatzi farm, Theydon Siding.

H. J. Daniel.—Has acquired a portion of farms Wolley and Ellerslie, Mazoe district.

H. T. Kirkup.—Has acquired farm Lochinvar, near Salisbury.

Capt. W. A. Dickenson.—Has acquired a portion of Zimati Kop, Rusape.

Capt. C. R. L. English.—Has acquired farm Lushington, Marandellas district.

R. G. Gossip.—Has acquired farm Tavydale, Mazoe district.

Commander J. M. Arnaud.—Has acquired portion of The Glebe, Salisbury district.

A. H. Wenborn, H. S. Thomas and N. McDonald.—Have acquired farm Lilstock, Mazoe district.

J. B. M. Powell and W. P. B. Piers.—Have acquired farm Middlesex, Marandellas.

M. Bennie.—Has acquired a portion of farm Foxton, Gwelo district.

C. H. Berrett.—Has acquired farm Belmont, Goromonzi.

G. J. Schofield.—Has acquired farm Melrose, Hunter's Road.

C. Butler.—Has purchased Villa Franca farm, Glendale.

W. I'Anson.—Has acquired Byrne View farm, Arcturus.

W. J. Hartnoll and J. F. Rutherford.—Have each acquired Crown land farms in the Marandellas district.

H. W. Webster and H. Layland.—Have each acquired Crown land farms east of Banket.

L. H. H. Payne.—Has acquired farm Upwey, Salisbury district.

C. H. Elmes.—Has acquired Canterbury farm, Hartley district.

J. N. A. Scott.—Has acquired farm Longcliff, Gwelo.

H. V. Chandler.—Has acquired farm Helenvale, Salisbury.

Correspondence.

[*No responsibility is accepted by this Journal for the views expressed by correspondents.*]

Wrey's Drift,
Odzi,
23rd March, 1927.

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Commercial Aspects of Tobacco Growing.

I should like to suggest that an article or series of articles on the £ s. d., the profit and loss or commercial side of Virginia tobacco growing by someone competent to write would be of incalculable interest and help to a large number of readers of the *Agricultural Journal* who are embarking on tobacco culture as a new crop.

We are inundated with advice on every phase of the growing and curing of a tobacco crop, but never a word is let fall as to the commercial value of such a crop from a business and book-keeping point of view—which, after all, is the view which matters most to the grower.

Personally, I find it impossible to obtain any really reliable information whatever on this aspect of the matter. At one time one hears from A that he has heard that B obtained 3s. 6d. per lb. for his crop last year. This was told me last October on authority which I had perforce to accept as reliable, and that B had profited to the extent of about £3,000—B being an absolute novice, I may say. I now hear the true facts, which are that B did not average 1s. 6d. per lb., that his crop was patchy and that he is indebted to the bank as a result.

And so it goes on. The wildest rumours are circulated, and believed, as to the profits to be gained by growing either the bright or heavy pipe tobacco. Even now many farmers believe they are paid in cash the 2s. per lb. protection duty, or some such nonsense.

If such information can be supplied by an expert or experts, then I think it should be based on the lines of the average crop per acre produced on average land by the average working farmer, who is glad to receive average prices for his leaf; and not on experimental farm returns, or on the extracts from the books of the few really very able and successful growers in the country. In short, I think such an article should present pessimistic rather than optimistic figures; the reader can supply his own optimism.

What I in particular should so much like to know is the average cost per acre of growing bright Virginia on light sandy loam, including manuring; cost of stumping to be omitted. Also the average yield per acre that might be expected in a normal year (though of course in Rhodesia all our normal seasons are abnormal). I have been ten years in the country and never known a normal season yet. However, that is by the way.

Then the average amount of first, second and third grade leaf that might be cut from each acre, and lastly, the average price which might be paid by the tobacco buyer for each grade of leaf, and also the amount of deductions per lb. of leaf sold for warehousing, handling, agent's charges, commission, etc., which in the case of the cotton crop cut so seriously into the grower's profits.

Then, if the author has the time and a turn for figures, he might be kind enough to show some examples of the interest return on an outlay of, say, £500, £1,000 or £1,500 to grow 10 acres, 50 acres and 100 acres of tobacco, putting the price of the land at £1 per acre for the sake of uniformity, and estimating cost of flue curing barns at cost of standard type of permanent barns, not the cheapest nor yet the most expensive.

I fear that I am asking for a great deal of information, but I feel sure that some of the accountants of Salisbury or at the tobacco warehouse could supply a considerable portion

of it, and so help a large number of men to a true view of the situation.

I am, etc.,

G. A. Evans.

P.S.—A difficulty may arise owing to the variation in rates of pay of native labour over the Colony; but a flat rate can be adopted of, say, 15s. to £1 per month for adults for the sake of argument.—G. A. E.

The Tobacco and Cotton Expert appends the following remarks:—

The information asked for is not constant throughout the whole of the Colony. Variations in the costs and returns per acre are bound to arise through seasonal and labour conditions. There are great differences between the capabilities of the farmers, and while one man may conduct his farming on a sound economic basis, another may spend needlessly. Roughly calculated, the growing costs are approximately £10 per acre. The average yield is about 425 lbs. per acre. The average price cannot be definitely stated, as this would vary with the seasons and between each farmer.

The Editor,

The Rhodesia Agricultural Journal.

Sir,

A Tobacco Seed Breeding Station.

Thanks, I understand, mainly to Mr. Henderson, a type of bright tobacco has been found which has proved to be extremely suitable to the sub-tropical tobacco growing regions of the Rhodesias and Nyasaland.

To those who struggled with the various disappointing types of tobacco which were in vogue before "Henderson's Hickory Pryor" made its appearance the capabilities of this latter type have been a complete and welcome surprise, and great credit is due to its originator. I think it is not an exaggeration to say that without this successful and profit-

able variety tobacco growing would not be possible on the extensive scale now being undertaken.

I think, however, it is a pity that the name "Henderson's Hickory Pryor" was ever used. The product is no more like the U.S.A. "Hickory Pryor" than cheese is like chalk, and I venture to suggest a more applicable title might be chosen (Henderson's Rhodesian?).

The purpose of this communication, however, is to point out that now we have obtained this valuable type every effort should be made to maintain and even, if possible, improve it. It is very difficult for the ordinary grower to go in for much plant breeding, and though efforts are being made in various directions, I wish to suggest that in view of the importance of the subject the tobacco growers of Southern and Northern Rhodesia and Nyasaland might combine in a joint effort to establish a seed breeding station which would supply their future needs with the very best seed obtainable.

The organisation I had in mind in making this suggestion was that of the Swedish Seed Association, an organisation formed by the private efforts of a group of Swedish farmers. Bailey and Gilbert, "Plant Breeding," refer to this organisation as follows (pages 304 and 305):—

"The Swedish Association has an interesting history and an enviable record. It has done more, probably, than any other organisation to reshape our conception and methods of selection. Dr. Nilsson and his associates have started on a large scale the principle of individual selection in contrast to the older method of mass selection, which is now largely given up. The group of scientists at Svalöp have not only shown their ability to produce practical results, but they have also elaborated scientific principles.

"The founding of the station at Svalöp is wholly due to the private initiative of a group of Swedish farmers. The purpose of the association has always been to produce practical results, to breed better grains for local use.

"But the station has been fortunate from the first in having in its employ expert botanists, whose skill has not only produced many noteworthy new varieties, but who have elaborated scientific principles of far-reaching importance. *These men have been given a free hand to pursue their work*

without such distracting activities as teaching, comparative field trials, commercial analyses and the like. (Italics mine.) This fact, together with an unrestricted organisation, a well selected programme and an expert corps of assistants, accounts for the wonderful success of this station. This Swedish Seed Association has two groups of members—those who are permanent after having paid 28 dollars once for all, and those who pay annually 1 dollar 40 cents.

"The association has an annual budget of about 40,000 dollars, derived from dues of members, contributions from agricultural associations, Government aid and the sale of pedigreed seed. Funds from the last two sources have increased very rapidly in recent years. Gifts of various kinds, amounting to 77,000 dollars, have been set aside for buildings."

I put forward the suggestion as a basis for discussion, and think that a joint effort in the direction suggested would be of more value than individual efforts scattered over the three Colonies.

I am, etc.,

"A NYASALAND CORRESPONDENT."

The Editor,

The Rhodesia Agricultural Journal.

Sir,

The Tobacco Preference.

This letter is an appreciation of your remarks and comments in the Editorial of the *Rhodesia Agricultural Journal* for April entitled "Tobacco." As a tobacco grower I do not believe the preference given by the Home Government is being passed on to the producer, and if, as stated, the best Rhodesian tobacco is being blended with American tobacco, then that is against the whole spirit of the preference given to Empire-grown tobacco and should have the attention of the Government concerned. The producer in Rhodesia can only safeguard his interests, firstly, by unity; and, secondly, by being backed up by his Government. As already stated by you, it is evident the grower here is not directly benefited by the preference, and that the manufacturer is, if report is correct. The Imperial Tobacco Co. made a profit of nearly

nine million pounds in their last financial year. As the success of tobacco growing means so much to the future success of this Colony, it is only right that the grower should have his due reward, especially as he takes all the risks and is also in the favoured position of being able to grow the bright leaf. The article you refer to, and from which you quote, in the trade journal *Tobacco*, is nothing but propaganda work by the monopolists to direct public attention from their own huge profits, for as soon as the grower commences to make good, this is the sort of thing that one hears.

Yours faithfully,

W. S. WHALEY.

Trio Mine,
Private Bag,
Salisbury,
15th April, 1927.

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Ploughing by Tractor.

Could you, or would some kind reader of the *Rhodesia Agricultural Journal*, please tell me the cost per acre of working a Fordson tractor (1) with a three-furrow disc plough in new lands (heavy black vlei); (2) with a two-furrow mouldboard plough in old lands (red loam)? I am told the cost is more than the average man can afford, but I should like to make certain, as the labour question in the ploughing season in this part of the country is beyond description.

Thanking you in anticipation.

I am, etc.,

"TRACTOR."

Fallowfield,
Plumtree.

[There is no reliable departmental information on the points raised. Will a reader oblige?—Ed.]

Southern Rhodesia Weather Bureau.

MARCH, 1927.

Pressure.—During the month the mean barometric pressure was above normal in the south and east and below normal to the north and west, Fort Victoria being 0.024 in. above normal and Livingstone being 0.026 in. below normal. With the exception of some low pressures recorded between the 5th and 8th, the general fluctuations of pressure were slight. Seven low pressure systems were in evidence during the month. On the 1st and 2nd a small low was in evidence off the east coast. On the 3rd pressure was very low at Lourenco Marques; a low was off Beira on the 4th and 5th and could be traced to the north-east until the 9th. It is probable that this low was related to the disturbances at Mauritius and on the east coast of Madagascar at that time. A small low appeared off the south coast on the 10th and moved north-east with little effect. A southerly low was off the south and east coasts on the 12th, 13th and 14th, and this, in conjunction with a northerly low, reduced the pressure at Kenhardt on the 15th. A southerly low was in evidence on the 19th, 20th, 21st and 22nd, but did not move up the coast. A southerly low appeared off Capetown on the 22nd and 23rd and was off the east coast on the 25th in conjunction with a northerly low in the interior. The southerly low moved up the east coast and could be traced until the 29th. Local pressure was affected very little. A southerly low of little intensity was in evidence off the south coast from the 28th to the 31st. The low of the 3rd to 9th was the only one affecting local pressure to any extent.

Six highs affected local pressure during the month. Of these the first four were normal, of low intensity, appearing off the south coast and moving into the interior to the south of this country. The local pressure was affected by these on the 2nd to 4th, 6th, 8th, 10th, 12th and 13th. The next high appeared off the west coast on the 13th and 14th and remained off the south-east coast with fair intensity from the 15th to

19th, and then moved inland with very little intensity, and was traceable until the 23rd. A high, apparently connected with this system, was in evidence inland from the 16th to 18th, forming a centre of high pressure in Southern Rhodesia. A further high appeared off the Cape on the 26th, was off the south-east coast on the 27th to 29th, and then moved inland, remaining, however, further south than usual.

Temperatures.—The mean temperature for the month was considerably below normal, varying from 2.5° F. below normal at Hartley to 0.5° F. above normal at Gwelo.

The mean maximum temperature was below normal, varying from 3.9° F. below normal at Fort Victoria to 3.6° F. above normal at Tuli.

The mean minimum temperature during the month was below normal, varying from 3.8° F. below normal at Sinoia to 0.6° F. above normal at Gatooma.

Relative humidity was generally about normal, varying from 7 per cent. above normal at Salisbury to 12 per cent. below normal at Enkeldoorn.

Rainfall.—The mean rainfall over the country amounted to 2.33 inches, as compared with a normal of 4.23 inches.

The mean rainfall recorded in the various zones is as follows:—

	Rainfall, March, 1927. Inches.	Normal, March. Inches.
Zone A (W. Matabeleland)	1.27	3.40
Zone B (S.-E. Matabeleland) ...	1.12	3.06
Zone C (W. Mashonaland)	3.00	4.72
Zone D (N.-E. Mashonaland) ...	3.46	5.14
Zone E (S.-E. Mashonaland) ...	3.16	5.03
Zone F (Eastern Border)	4.95	8.86

From the above it will be noted that the rainfall was generally much below normal, particularly in Matabeleland.

In Zone A the district with the greatest mean rainfall was Sebungwe with 1.72 ins., and the district with the least mean rainfall was Bulalima-Mangwe with 0.65 in.

In Zone B the district with the greatest mean rainfall was Chibi with 1.77 ins., and the district with the least mean rainfall was Matobo with 0.59 in.

In Zone C the district with the greatest mean rainfall was Lomagundi with 3.88 ins., and the district with the least mean rainfall was Sebungwe with 1.38 ins.

In Zone D the district with the greatest mean rainfall was Inyanga with 7.78 ins., and the district with the least mean rainfall was Mtoko with 2.09 ins.

In Zone E the district with the greatest mean rainfall was Inyanga with 8.45 ins., and the district with the least mean rainfall was Belingwe with 0.43 in.

In Zone F Umtali had 7.64 ins., and Melsetter had 4.51 ins.

Rain Periods.—The rainfall during the month can be divided into two distinct periods, from 1st to 12th and from 17th to 29th. The first period was a continuation of the heavy rain which occurred on the 27th and 28th of February. On the 1st showers were numerous and general; 2nd, showers occurred in north Mashonaland and eastern border; 3rd and 4th, showers over eastern border; 5th, the showers extended over Mashonaland; and on 6th were general in Mashonaland and heavy over eastern border. From this date the weather tended to clear, light scattered showers being reported over Mashonaland and eastern border up to the 12th. This period of rain was due principally to the presence of a southerly low off the east coast during the period 3rd to 9th, and the absence of rain in Matabeleland was probably due to the influence of small highs in the interior to the south almost throughout the period. The following period of rain worked up gradually; on the 17th, 18th and 19th local showers were reported; on the 20th, 21st and 22nd local showers were numerous, and heavy rain occurred at Concession on the 20th; on the 23rd showers were numerous, general in north-east Mashonaland and heavy in parts; 24th, showers were reported from Mashonaland, with local showers elsewhere; from the 24th the weather began to clear, and showers were confined to north Mashonaland, being numerous on the 25th, local on the 26th and 27th, and a few showers were recorded on the 28th and 29th. During the whole of this period pressure in Rhodesia was very constant and slightly above normal, with very flat gradients.

RAINFALL.

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	2.24	1.61	12.68	22.35
Imbesu Kraal ...	...	...	...	23.32
Inyati ...	3.26	.13	12.10	23.91
Judsonia ...	2.64	.95	10.60	n.s.
Martha Farm ...	3.11	1.53	14.46	n.s.
Shangani Estate ...	2.45	1.14	13.99	22.04
Bulalima-Mangwe—				
Centenary ...	3.31	.54	12.08	n.s.
Kalaka ...	2.75	...	14.07	21.85
Riverbank ...	1.79	...	12.49	22.39
Solusi Mission ...	3.81	.76	15.00	23.33
Bulawayo—				
Fairview Farm ...	3.51	.76	13 39	21.36
Keendale ...	3.70	.31	14.35	21.03
Lower Rangemore ...	3.44	1.01	13.47	22.22
Observatory ...	3.79	.67	15.40	23.84
Gwelo—				
Dawn ...	3.94	2.12	13.86	24.00
Delano Estate ..	6.21	.18	21.94	n s.
Gwelo Gaol ...	5.12	2.17	20.76	25.46
Riversdale Estate ...	...	...	10.20	n.s.
Somerset Estate ...	5.56	.84	17.12	24.33
Insiza—				
Orangedale ...	3.44	...	14.07	27.01
Shangani ...	3.11	...	11.35	22.51
Thornville ...	3.14	1.41	12.81	24.01
Nyamandhlovu—				
Edwaleni ...	...	...	6.99	22.46
Gwaai Reserve ...	2.70	.45	13.32	n.s.
Impondeni ...	2.90	.53	16.45	n.s.
Naseby ...	3.51	1.44	15.27	21 35
Nyamandhlovu Railway ...	1.44	...	10.04	21.87
Sebungwe—				
Gokwe ...	11.03	1.72	29.03	27.42
Umzingwane—				
Springs ...	4.70	.88	15 48	23.48
Wankie—				
Matetsi Railway ...	5.95	.93	24.78	28 70
Ngamo Railway ...	5.04	1.27	17.61	27.79
Sukumi ...	6.08	1.48	24.24	n.s.
Victoria Falls ...	3.60	...	20.55	26.89
Wankie Hospital ...	11.18	...	18.83	22.11
Waterford ...	...	...	17.68	...
Zone B.:				
Belingwe—				
Bickwell ...	3.77	.65	15.38	22.96
Bulalima-Mangwe—				
Bruwapeg ...	2.36	.14	9.55	n.s.
Edwinton ...	2.59	.25	13.85	20.93

RAINFALL—(*Continued*).

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	2.36	...	12 20	20.78
Garth ...	3 02	.34	18.49	24.49
Maholi ...	2.72	.57	18.77	22.45
Retreat ...	3.24	.53	14.36	21.24
Sandown ...	3.40	.45	12.69	n.s.
Semokwe Reserve ...	1.89	1.45	10.82	n.s.
Tjankwa ...	...	...	21.16	23.50
Tjompanie ...	2.89	1.47	23.51	22.43
Chibi—				
Nuanetsi Homestead ...	1.43	1.77	4.58	15.38
Gwanda—				
Antelope Mine ...	9.08	...	16.36	19.46
Gwanda Gaol ...	2.55	.64	10 86	20 34
Limpopo ...	.30	.88	5.41	n.s.
Mazunga ...	1.23	2.76	9.23	15.90
Tuli ...	1.30	.79	8.72	13.80
Insiza—				
Albany ...	2.32	1.47	12.56	21.73
Filabusi ...	.67	.45	9 39	20.78
Fort Rixon ...	1.81	1.78	12 95	21.69
Inyezi	3.15	.87	18 92	21 23
Lancaster ...	1.64	.88	10 45	n.s.
Wanezi Mission ...	3.06	1.23	10.93	n.s.
Matobo—				
Bon Accord ...	4.36	.37	11.70	n.s.
Fort Usher ...	3.41	1.16	17.76	n.s.
Holly's Hope ...	4.28	.47	13.60	20.98
Longsdale ...	1.90	.10	13.08	n.s.
Matopo Mission ...	3.10	1.13	16.46	25.63
Matopo School ...	2.31	.70	15.24	n.s.
Mtshabezi Mission ...	1.68	.83	9.21	21 54
Rhodes Matopo Park ...	1.11	...	15.14	23.14
Wenlock Ranch ...	1.78	Nil	7.63	n.s.
Umzingwane—				
Balla Balla ...	3.06	1.42	15.10	23 32
Essexvale ..	3.27	...	14 14	22.72
Heany Junction ...	2.09	.48	15.64	25.37
Hope Fountain ...	4.42	...	13 45	24.75
Zone C.:				
Charter—				
Bushy Park ...	7.04	6.84	26.77	30.00
Enkeldoorn ...	7.65	1.51	28.55	30.83
Marshbrook ...	7.96	3.32	27 07	29.70
The Range ...	9.92	2.12	27.53	31.88
Vrede ...	8.90	.89	13.03	29.76
Chilimanzi—				
Beacon Hill ...	5.63	2.06	20.86	n.s.
Central Estates ...	8.27	4.58	26.42	31.25

RAINFALL—(*Continued*).

STATION.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Chilimanzi (continued)—				
Fourie's Post ...	6.22	.90	20.43	n.s.
Orton's Drift ...	4.55	1.51	18.10	31.25
Sebakwe Post ...	6.16	1.31	22.42	n.s.
Umvuma Railway ...	4.81	1.76	16.20	28.84
Gwelo—				
Cross Roads ...	9.16	3.61	22.58	27.54
East Clare Ranch ...	6.28	1.71	18.26	n.s.
Globe and Phœnix Mine ...	5.80	2.39	18.35	28.54
Indiva ...	7.52	2.89	19.67	n.s.
Iron Mine Hill ...	6.64	...	21.55	n.s.
Lyndene ...	5.34	2.33	18.65	n.s.
Lannes Farm ...	7.68	1.63	18.95	n.s.
Rhodesdale Ranch ...	8.92	2.91	24.80	28.13
Woodendhove ...	7.53	2.84	28.43	29.85
Hartley—				
Ardgowan ...	9.47	3.29	31.80	32.25
Balwearie ...	8.61	1.22	25.63	n.s.
Battlefields ...	10.19	3.50	29.51	29.29
Beatrice ...	11 31	2.35	28.76	33.25
Carnock ..	6.66	2.70	27.29	32.21
Cromdale ...	7.59	2.51	27.29	n.s.
Deweras Store ...	10.04	1.63	27.04	n.s.
Eiffel Blue Mine ...	11.28	1.97	27.21	n.s.
Elvington ...	8.68	3.76	31.41	31.77
Gatooma ...	14.18	...	37.19	32.51
Gatooma Experiment Station	10.67	...	30.05	n.s.
Gowerlands ...	9.83	2.84	28.11	30.52
Handley Cross ...	9.21	1.29	23.11	n.s.
Hartley Gaol ...	10 86	...	27.14	31.64
Hopewell ...	5.99	...	22.29	32.67
Jenkinstown ...	8.28	...	24.88	31.84
Maida Vale ...	9.76	1.36	30.61	n.s.
Nyadgori ...	5.87	2.32	21.84	n.s.
Palham ...	6.61	2.12	21.89	33.73
Ranwick ...	9.34	2.16	32.55	31.55
Rocky Spruit ...	8.18	2 65	29.43	n.s.
Thornby ...	...	...	...	30.09
Thorndyke ...	6.19	2.14	17.52	n.s.
Lomagundi—				
Argyle ...	4.12	3.38	21.01	29.84
Baguta ...	...	...	11.41	30.61
Between Rivers ...	6.90	5.21	27.22	n.s.
Tsanunu ...	4.49	2.58	17.08	n.s.
Citrus Estate ...	5.62	2.94	23.72	28.94
Darwendale ..	5.67	3.29	22.48	30.04
Debera ...	...	...	14.13	n.s
Devonia ...	8.24	5.33	30.44	29.38
Dingley Dell ...	4.63	5.04	19.81	n.s.
Elinda ...	...	...	6.84	n.s.
Gambuli ...	5.66	2.69	22.49	32.61

RAINFALL—(*Continued*).

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi (continued)—				
Msina ...	5.72	...	19 61	n.s.
Impingi ...	4.74	4.71	32.91	n.s.
Kapiri ...	4.66	3.91	26.27	n.s.
Lone Cow Estate ...	3.43	3.74	21.97	30.79
Mafoota ...	5.05	3.54	22.75	n.s.
Maningwa ...	5.68	1.97	21.72	29.95
Mica Field ...	9.57	3.50	27.12	n.s.
Montrose ...	6 05	...	20.72	n.s.
Mpandegutu ...	7.97	3.75	27.79	n.s.
Mukwe River Ranch ...	5.87	3.66	24.84	28.11
North Banket ...	7.35	4.05	28.08	n.s.
Nyapi ...	6.91	1.72	26.11	n.s.
Nyarora ...	4 86	2 56	23.68	n.s.
Nyati ...	...	...	18 64	n.s.
Palm Tree Farm ...	9 28	5.10	28.23	29.81
Puri ...	...	3.88	26.66	n.s.
Raffingora ...	4.35	4.14	26.73	n.s.
Richmond ...	5.83	3.42	27.12	n.s.
Robbsdale ...	4 65	4.31	20.80	n.s.
Romsey ...	4.82	4 03	21.79	n.s.
Silater Estate ...	6.16	3.67	26.11	n.s.
Sinoia ...	7.04	1.66	26.12	30.15
Sinoia's Drift ...	4.10	...	17.55	n.s.
Sipolilo ...	...	...	35.36	30.00
Umboe ..	5.43	3.60	23.55	n.s.
Umvukwe Ranch ...	4.74	2.83	23.60	30.69
Woodleigh ...	6.38	3.72	26.90	n.s.
Yeanling ...	7.45	2.55	25.62	n.s.
Salisbury—				
Avondale (Broadlands) ...	4.62	1.88	20.89	31.29
Ballineety ...	5.95	1.53	20.22	n.s.
Botanical Experiment Station	3.10	...	14.93	30.68
Bromley ...	5.79	2.29	24.98	32.20
Cleveland Dam ...	4.19	1.95	25.32	30.59
Gwebi ...	5.74	3.23	23.15	31.56
Hillside ...	...	...	...	27.57
Lochinvar ...	2.98	...	15.71	28.83
Manor Farm ...	6 79	2 27	19.02	n.s.
Salisbury Agricultural Dept.	5.29	2.13	20.97	n.s.
Sebastopol ...	4.05	2.34	21.21	32.29
Stapleford ...	1.81	4.56	23.45	33.30
Tobacco Experiment Station	...	1.62	18.06	n.s.
Western Commonage ...	3.48	2.43	20.23	32.59
Sebungwe—				
Sikombela ...	6.75	.70	22.97	31.71
Wolverley ...	6.50	2.06	21.39	n.s.

RAINFALL—(*Continued*).

STATION.		1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE D. :					
Darwin—					
Cullinan's Ranch	...	6.77	...	21.82	n.s.
Fountains	...	8.53	3.32	18.44	n.s.
Mount Darwin	...	5.91	...	21.72	30.47
Rusambo	...	3.76	3.13	20.51	n.s.
Inyanga—					
Inyanga	...	4.33	6.27	27.27	37.43
Juliasdale	...	5.55	9.30	28.92	n.s.
Rhodes Estate	...	4.79	...	21.16	38.04
Makoni—					
Ardlamont	...	2.37	4.97	20.73	n.s.
Eagle's Nest	...	4.93	2.70	25.88	33.44
Mayo Ranch	...	...	...	...	n.s.
Nyogeni	...	3.05	1.57	13 65	n.s.
Kelvin	...	...	...	...	n.s.
Wensleydale	...	4.74	4.64	21.55	n.s.
Marandellas—					
Fault Farm	...	4.81	3.84	27.01	n.s.
Mazoe—					
Argyle Park	...	5.15	2.81	22.64	n.s.
Atherstone	...	8.55	3.84	25.87	n.s.
Bellevue	...	6.30	2.16	23.93	n.s.
Benridge	...	5.14	4.35	26.02	n.s.
Bindura	...	9.69	3.60	25.57	33.39
Ceres	...	8.01	4.64	28.71	35.89
Chipoli	...	2.99	...	18.89	31.94
Citrus Estate	...	5.72	4.20	25.52	32.41
Craigengower	...	6.86	3.81	24.73	31.27
Dandejena	...	...	...	18.04	n.s.
Donje	...	5.94	4 55	29.34	n.s.
Dundry	...	...	...	...	n.s.
Frogmore	...	5.36	7.26	28.27	n.s.
Glen Divis	...	5.36	6.65	29.57	n.s.
Glen Grey	...	5.47	...	22.86	n.s.
Hinton	...	6.48	2.96	23.02	n.s.
Great B	...	8.70	1.22	24.33	n.s.
Kilmer	...	7.27	...	21.10	31.36
Kingston	...	8.28	6.28	29.87	35.85
Mazoe	...	5.31	5.03	23.73	32.66
Maienzi	...	3.58	...	16.98	n.s.
Marston	...	5.34	1.52	19.32	n.s.
Mgutu	...	3.74	2.48	24.25	n.s.
Muripfumba	...	6.98	5.56	25.30	n.s.
Omeath	...	6.50	6.46	23.25	31.52
Pearson Settlement	...	6.48	4.32	25.69	n.s.
Pembi Ranch	...	7.25	5.99	27.77	n.s.
Riversdale Estate	...	7.00	2.73	27.73	n.s.
Ruia	...	7.23	7.41	30.49	35.27
Horta	...	8.91	3.48	28.52	32.26
Rustington	...	5.09	3.29	23.38	n.s.
Shamva Mine	...	4.50	...	20.90	33.34

RAINFALL—(*Continued*).

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Stanley Kop ...	5.64	...	20.89	30.97
Sunnyside ...	8.89	5.69	34.23	32.84
Teign ...	7.56	5.71	26.09	n.s.
Usk ...	8.62	4.09	31.93	35.77
Vergenoeg ...	...	...	...	n.s.
Virginia ...	7.48	...	23.97	30.71
Visa ...	5.03	7.56	30.83	n.s.
Woodlands ...	9.76	4.78	29.15	32.85
Zombi ...	3.84	1.72	23.54	35.26
Mrewa—				
Maryland ...	3.69	3.06	23.00	33.37
Mrewa ...	4.08	2.56	26.26	34.88
Selous Nek ...	3.92	1.45	19.19	33.42
Mtoko—				
Makaha ...	4.73	2.77	21.71	31.49
Mtoko ...	3.77	...	22.11	27.70
Nyaderi Mission ..	2.96	1.41	22.23	n.s.
Salisbury—				
Arcturus ...	8.87	3.17	30.83	36.67
Calgary ...	5.46	1.38	21.23	n.s.
Chindamora Reserve ...	2.76	3.74	20.79	n.s.
Chinyika ...	3.93	...	21.29	n.s.
Glenara ...	3.08	2.40	20.59	31.29
Goromonzi ...	3 86	2.18	26.10	37.98
Hatcliffe ...	7.93	1.68	22.24	33.31
Hillside (Bromley) ...	5 02	1.86	26.74	n.s.
Kilmuir ...	4.47	2.75	27.30	n.s.
Meadows ...	5.18	2 77	26.05	37.84
Pendennis ...	3.29	2.78	20.49	n s.
Selby ...	4.26	5.36	23.85	30.38
Springs ...	3.11	2.80	20.31	n.s.
Teviotdale ...	5.23	1.53	12.02	n.s.
Vainona ..	4.76	1.48	20.53	33.09
Zone E.:				
Belingwe—				
Belingwe (N.C.) ...	2.86	.39	9 42	22.92
Doro ...	4.00	...	11.29	n.s.
Shabani ...	3.33	.47	9.52	n s.
Bikita—				
Angus Ranch ...	...	...	7.67	23.46
Bikita ...	6 99	...	17.32	n.s.
Devuli Ranch ...	4.31	3.29	14.45	n.s.
Charter—				
Buhera ...	7.64	1.87	27.32	34.04
Chibi—				
Chibi ...	4.34	.67	14.04	22.90
Lundi ...	4.52	3.12	13 58	20.86

RAINFALL—(Continued).

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Chilimanzi—				
Alanberry ...	6.20	2.01	19.81	27.42
Driefontein ...	4.95	3.49	18.91	26.38
Felixburg ...	5.30	3.19	19.07	29 38
Grootfontein ...	4.62	2.54	18.81	28.32
Induna Farm ...	4.24	3.15	17.11	30.87
Mtao Forest ...	5.44	3.06	17.17	n.s.
Mukowries ...	6.30	3.21	19.81	n.s.
Requeza Estate ...	5.05	2.33	17.63	n.s.
Thornhill ...	5.10	4.62	18.62	n.s.
Gutu—				
Alheit Mission ...	5.01	3.19	15.35	22.73
Chindito ...	4.72	4.72	21.34	31.61
Eastdale Estate ...	7.53	1.34	20.75	30.31
Gutu ...	...	2.82	19.80	29.44
Glenary ...	5.84	5.16	25.12	25.27
Gwelo—				
Glencraig ...	6.24	1.79	19.10	n.s.
Partridge Farm ...	5.98	2.91	21.36	34.62
Sheep Run Farm ...	4.87	1.37	19.13	29 00
Inyanga—				
St. Trias' Hill ...	2.76	8.45	28.91	37.39
Insiza—				
Roodeheuvel ...	2.43	1.03	13.61	25.78
Makoni—				
Craigendoran ...	6.44	...	23.78	28.58
Forest Hill ..	4.94	5.57	24.49	30.16
Gorubi Springs ...	5.37	3.77	24.01	30.64
Inyagura ...	...	...	18.68	n.s.
Makoni Kop ...	4.16	4.69	24.47	n.s.
Mande ...	...	...	15.81	n.s.
Mona ...	3 56	6.10	22.37	34.06
Monte Cassino ...	3.54	2 73	27 58	33.67
Romsley ...	...	...	...	n.s.
Ruati ...	7.84	...	23.95	n.s.
Rusape ...	...	...	14.27	29.44
Tablelands ...	8.05	6.10	33.55	n.s.
Tsungwesi Ranch ...	...	...	18.92	n.s.
Springs ...	4.30	4.14	28.86	30.35
Whitgift ...	6.53	3.61	20.46	n.s.
Marandellas—				
Bonongwe ...	5.92	.80	21.32	31.35
Delta ...	4.48	2.62	18.81	31.07
Elandslaagte ...	5.54	3.83	22.13	n.s.
Marandellas Estate ...	5.42	2.11	25.48	31.27
Lendy Estates ...	2.23	...	25.30	33.50
Lushington ...	2.94	3.68	19.27	n.s.
Macheke ...	3.14	3.27	22.50	34.19
Marandellas ...	5.87	3.37	26.74	35.58
Nelson ...	7.04	1.78	24.52	27.49
Tweedjan ...	5.29	3.51	25.04	33.39
Wenimbi ...	2.20	5.39	27.28	n.s.

RAINFALL—*(Continued)*.

STATION.		1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(continued)					
Melsetter—					
Brackenbury	...	5.73	10.75	33.21	51.80
New Year's Gift	...	6.35	2.68	19.03	n.s.
Ndanga—					
Doornfontein	...	5.16	2.98	18 37	25.48
Manjirenji	...	...	...	7.44	n.s.
Marah Ranch	...	4.83	2.99	19.98	30.35
Zaka	...	6.52	2.91	19.97	37.39
Selukwe—					
Aberfoyle Ranch	...	4.30	2.15	15.60	30.37
Danga	...	...	...	...	n.s.
Hillingdon	...	7.04	3.03	23.39	30.59
Impali Source	...	6.15	1.17	17.12	n.s.
Rio	...	5.51	1.40	19.91	28.65
Safago	...	7.09	.91	21.01	31.56
Selukwe Gaol	...	7.81	2.76	28.60	n.s.
Tokwe Block	...	4.13	...	14.14	n s.
Woodlands	...	5.57	1.24	19.36	n.s.
Umtali—					
Alicevale	...	6.51	8.77	29.39	30.43
Argyll	...	4.03	5.89	22.59	30.29
Embeza	...	10.14	6.72	44.47	n.s.
Fairview	...	6.73	6.23	30.78	n s.
Fern Valley	...	7.29	2.95	22.75	n.s.
Jerain	...	3.28	4 88	17.64	31.01
Mutambara Mission	...	4.53	2.05	20.02	28.59
Odzani Power Station	...	6.89	7.12	31.00	36.02
Park Farm	...	6.15	5.71	30.12	n.s.
Premier Estate	...	6.33	4.40	22.24	29.69
Sarum	...	4.00	3.86	20.02	25.64
Stapleford	...	7.18	5.91	41.01	70.53
St. Augustine's Mission	...	24.34	5.94	47.13	n.s.
Transsau Estate	...	4.30	6.47	25.74	n.s.
Umtali Gaol	...	7.61	4.89	24.54	31.70
Victoria—					
Bruceharne	...	3.71	2.11	16.88	26.90
Cambria	...	3.75	2.10	14.56	n.s.
Cheveden	...	7.91	3.95	24.23	n.s.
Clipsham	...	3.44	2.67	12.87	27 46
Gokomere	...	4.85	4.14	16.16	27.89
Mashaba	...	5.72	1.78	15 93	n.s.
Miltonia	...	3 64	2.23	18.88	n.s.
M'Sali	...	5.68	3.31	15.89	n.s.
Riverdene North	...	5.49	...	13.22	28.35
Salemore	...	5.39	2.62	18 52	n.s.
Silver Oaks	...	3.56	3.17	18.42	27.51
Stanmore	...	5.72	5.72	18.23	n.s.
Victoria	...	3.06	...	12.77	25.45
Zimbabwe	...	5.45	2.14	20.32	n.s.

RAINFALL—(*Continued*).

Station.	1927. Feb.	1927. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone F.:				
Melsetter—				
Chikore ...	6.08	4.90	27.92	39.00
Chipinga ...	...	...	...	40.37
Lettie Swan ...	4.10	3.43	28.28	n.s.
Melsetter ...	7.28	...	28.60	42.76
Mount Selinda ...	9.08	...	31.35	56.72
Springvale ...	...	...	...	n.s.
Tom's Hope East ...	12.21	5.20	23.26	45.30
Vermont ...	...	...	38.04	58.46
Umtali—				
Chimeze ...	9.10	7.64	41.51	n.s.
Hoboken ...	...	...	...	n.s.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	May	June
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	14	11
Banket Junction	Banket Hotel	F. Potts	6	3
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	26	30
Bindura	Bindura Farmers' Hall	W. E. Fricker	14	11
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	18	1
Bubi	Queen's Mine	E. C. Gaudin	10	14
Chakari	Various farms	L. T. Tracey	19	16
Chatsworth	Makowries Farm	A. W. White	7	4
Daisyfield	Daisyfield (April), Somabula (May)	L. E. Edwards	14	18
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	14	11
Enterprise	Farmers' Hall	John Johnstone	2	6
Essexvale	Essexvale	C. Geneve	15	19
Felixburg—Gutu	Gungwe (May), Felixburg Farm (June)	C. L. Burrows	14	11
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	3	7
Gadzema	Gadzema	G. M. Leahy	8	12
Gatooma	Speck's Hotel	C. M. Davenport	21	18
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	2	6
Greystone	Quarrie Farm	P. J. van der Walt	14	...
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	12	9
Inyazura	Inyazura	Major Tulloch	...	3
Lalapansi	Lalapansi	Edmund Chapman	14	11
Lomagundi	Sinoia	F. W. Robertson	...	...
Lomagundi West	Various farms	E. Morton	15	12
Macheke	Macheke	M. J. Palmer	14	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	1	5
Makwiro	Makwiro	F. H. Howard	20	17
Makoni	Rusape	—. Munch	14	11

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	6	3
Marandellas, Southern	Various farms	D. J. Gale	4	1
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	13	10
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	12	9
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	21	18
Mazoe (Concession)	Concession Hotel	Frank Allen	10	14
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	11	8
Melsetter	Court House, Melsetter	Dr. Rose	12	9
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	11	8
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	28	25
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	6	3
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	7	4
Poorte Valley	Various places	D. Wilson	21	18
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	21	18
Salisbury South	Various farms	P. Linton	25	29
Selukwe	The Hotel, Selukwe	W. T. Simpson	6	3
Shamva	Shamva Hotel	E. Butler	19	16
Two Rivers Farming Association	Various farms	W. L. Parsons	14	11
Umboe (Branch of Lomagundi F.A.)	Various farms—Farm Umboe (May)	A. J. Hawkes	14	11
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	14	11
Umtali	Drill Hall, Umtali	A. Howat	5	2
Umvuma and District	Umvuma	H. B. Colling	Not	received
Victoria	Victoria	H. Payne	13	10
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	11	8
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	..	...	112	..	...	884
March ...	125	1,837	...	2,323	...	...	84	...	...	4,369
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

May.

BEE-KEEPING.

The scarce supply of nectar, due to conditions of drought, will be responsible for a deficiency of stores. Where this is noticed, steps must at once be taken to supply the bees with artificial food in the shape of syrup. A feeder must be placed above the frames inside the hive. Never feed bees outside, as it promotes robbing.

CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily.

Where necessary, irrigation should be continued up to within 10 days of harvesting.

All ploughing and cultivation should be completed without delay.

CROPS.

Ground nuts will be ripe, and, if not already raised, should be lifted before the first frosts in order that the hay may be saved in good condition. Pumpkins and majorda melons may be carried off the land to some convenient, shady spot, but should not be heaped. Mangels may safely be allowed to remain in the ground until required for use. All ensilage pits should be completed at latest by the beginning of this month. Sweet potatoes should be mature; the tops can be cut for green fodder and the tubers can be dug from about the end of the month onwards. Care should be taken to keep the cracks in the ridges of potato land filled, otherwise tuber moth will enter. The bulk of winter cereals on wet vleis or under irrigation should be sown, while earlier sown crops will probably benefit from rolling and harrowing.

DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month.

All holes should be completed and kept in readiness for June planting.

Ploughing or digging and cultivation should be completed without delay.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers, etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings, such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand.

See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

Place orders for any trees proposed to be planted during the ensuing season, so that nurserymen may make provision.

POULTRY.

All cockerel chickens should be separated from the pullets, and every month be gone over carefully, the poorer ones eliminated and only the very best kept. Many poultry keepers are apt to keep a lot of cockerels running about which would never be any good for breeding from, eating their heads off and lowering the profits.

Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded.

The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. Remember that they require food for heat, energy, repair of wear and tear, and to produce bone, fat, flesh, tissue, blood and feathers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

Now that the rains have stopped turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. By the middle of this month dairy cattle will require more serious attentien in the matter of feed. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—If the vleis have dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk.

TOBACCO.

Curing should be finished as early in the month as possible, to prevent loss from frost. The bales or bulks of cured tobacco should be examined weekly until sent to the warehouse. Tobacco seed should be shelled as soon as the seed pods are dry, and the seed carefully labelled and stored.

The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

Notes from the "Gazette.

"*Gazette*" *Date.*	*Items.*

PUBLIC ROAD.

25.3.27. Government Notice No. 80 of 11th February, 1927, declaring a public road from a point on Martin Farm to Deweras Ranch, is cancelled. (G.N. 164.)

BRANCH ROAD.

25.3.27. The following is declared a branch road under the provisions of section 2 of the "Road Regulations, 1896":—

From a point on Plot 59, situate at the southernmost point of Parktown, and thence in a northerly direction to Lot Z and along its eastern boundary; thence across the Makabusi River on the existing drift and across Plot 38, Block MM, Ardbennie, and along Strachan Street to its junction with 10th Avenue; thence eastward along 10th Avenue to its junction with Mitchell Street and along Mitchell Street northwards to its junction with 6th Avenue, and thence in an easterly direction along 6th Avenue to its junction with the Salisbury Commonage, at a point between Plot 9, Block T, and Plot 2, Block HH, Ardbennie Township. (G.N. 176.)

AFRICAN COAST FEVER.

1.4.27. Every owner of cattle in any area declared, in terms of section 17 of Government Notice No. 21 of 1917, to be an area of infection or guard area shall, if required to do so by an inspector, apply effective tick-destroying dressings to the ears and tails of such cattle, for which said purpose an inspector may require an owner to clip the brushes of the tails of such cattle or may otherwise prescribe the manner in which such dressings shall be applied. (G.N. 179.)

HEARTWATER.

1.4.27. In terms of the "Animals Diseases Consolidation Ordinance, 1904," heartwater in cattle and sheep is declared to be a destructive disease within the meaning of the Ordinance. (G.N. 180.)

"CATTLE CLEANSING ORDINANCE, 1918."

1.4.27. Government Notice No. 181 declares certain areas in the native districts of Sebungwe, Wankie, Inyanga, Melsetter, Chibi, Lomagundi, Darwin, Mtoko, Mrewa and Sabi Reserve to be exempted from the obligation of section 2 of the "Cattle Cleansing Ordinance, 1918," in lieu of the areas set out in Government Notices Nos. 676 of 1924 and 521 of 1925.

TSETSE FLY.

1.4.27. Government Notice No. 182 authorises until further notice the destruction of all game on Crown lands in the areas described below by such persons as may be approved by the Minister of Agriculture and Lands:—

1. That portion of the Lomagundi district lying between the Hunyani and Angwa Rivers north of latitude 17° 10′ S. and south of the latitude of Doma Hill.

2. That portion of the Lomagundi district lying east of the Hunyani River, north of latitude 17° S. and south of the Rukowakuona mountains.

3. A portion of the Hartley district consisting of a strip of country fifteen miles wide, lying immediately west of longitude 29° 45′ E. and north of the Umsweswe River.

CLOSURE OF ROAD.

8.4.27. Government Notice No. 194 authorises the closure of that portion of the old Filabusi-Fort Rixon road from a point on the farm Lancaster at the junction of the present Filabusi-Fort Rixon road to the common boundary of the farm York and the outspan.

DISTRICT ROAD.

8.4.27. The following is declared to be a district road in terms of section 2 of the "Road Regulations, 1896":—

From a point on the Umtali River on the existing Umtali-Old Umtali road; thence in a northerly direction through the farms Old Town and Hartsell; thence in a westerly direction through the farms Laverstock, The Grange, Premier Estate and Chikonga's Farm, through the southern corner of Odzi Drift and the farms Odzi Flat and Wrey's Drift to join the Odzi-Umtali road on that farm.

AFRICAN COAST FEVER.

8.4.27. Government Notice No. 323 of 1926 is cancelled and the following substituted:—

Native District of Mazoe.

(a) Area of Infection.

The farms Burnleigh and Trio.

(b) Guard Area.

The Joker Reserve. (G.N. 192.)

"GAME LAW CONSOLIDATION ORDINANCE, 1906."

8.4.27. The operations of sections 9, 10 and 12 of the above Ordinance are suspended in respect of all game, excluding birds, within the area in the Lomagundi native district defined under Government Notice No. 597 of 1926 until further notice. (G.N. 197.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 428. The Sweet Potato, by J. A. T. Walters, B.A.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 462. Hay-making in Rhodesia, by C. Mainwaring.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agr., F.L.S., Chief Agriculturist.
No. 504. Castor Oil, by Guy A. Taylor, M.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.

No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.

No. 552. Mixed Farming in Matabeleland, by Gordon Cooper.

No. 557. Selection of Virgin Land for Arable Farming, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

No. 560. Climatic Conditions and Cotton Growing in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.

No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

No. 571. A Farmers' Calendar of Crop Sowings, by C. Mainwaring.

No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.

No. 591. Maize Export Conference Proceedings.

No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 601. Maize for Export, by S. D. Timson.

No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.

No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

No. 634. Barley, by P. V. Samuels.

Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.

TOBACCO.

No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 623. Report on Experiments at the Tobacco Experiment Station, Salisbury, Seasons 1924-25 and 1925-26, by A. C. Newton, B.Sc.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 496. Statistics of Live Stock and Animal Products for the Year 1923, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.

LIVE STOCK.

No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part IV., by R. C. Simmons.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 392. Memorandum on the Cattle Industry of Southern Rhodesia, 1921.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 448. The Cattle Industry.
No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.
No. 469. Hand-Rearing of Calves, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 478. The Management of Sheep, by Montague Gadd.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.
No. 489. Further Notes upon the Feeding of Farm Animals, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.
No. 589. Raising Pigs for Profit, by MacW. Ingram, Garth Farm, P.B. Bulawayo.
No. 624. The Construction of Dipping Tanks for Cattle (Revised).
Arsenite Cattle Dip—How to Mix.

DAIRYING.

No. 383. Control of Temperature in Dairying, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 418. Manufacture of Cheddar Cheese, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 427. Common Defects in Butter-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 463. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 498. Gouda or Sweet-Milk Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 511. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).
No. 567. Cottage Cheese, by J. R. Corry, B.Sc. (Agr.).
No. 572. The Pasteurisation of Milk and Cream, by J. R. Corry, B.Sc. (Agr.).
No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).
No. 583. Cream Cooling Devices, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 594. Milk Recording and its Advantages, by T. Hamilton, M.A., N.D.A., N.D.D. Introduction by J. R. Corry, B.Sc.
No. 604. Farm Butter Making, by T. Hamilton, M.A., N.D.D., N.D.A., Dairy Expert.
No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.
No. 612. Production of First-Grade Cream, by J. R. Corry, B.Sc.
Drawings of cow byres and a farm dairy can be obtained upon application to the Dairy Expert, Department of Agriculture, Salisbury.

VETERINARY.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
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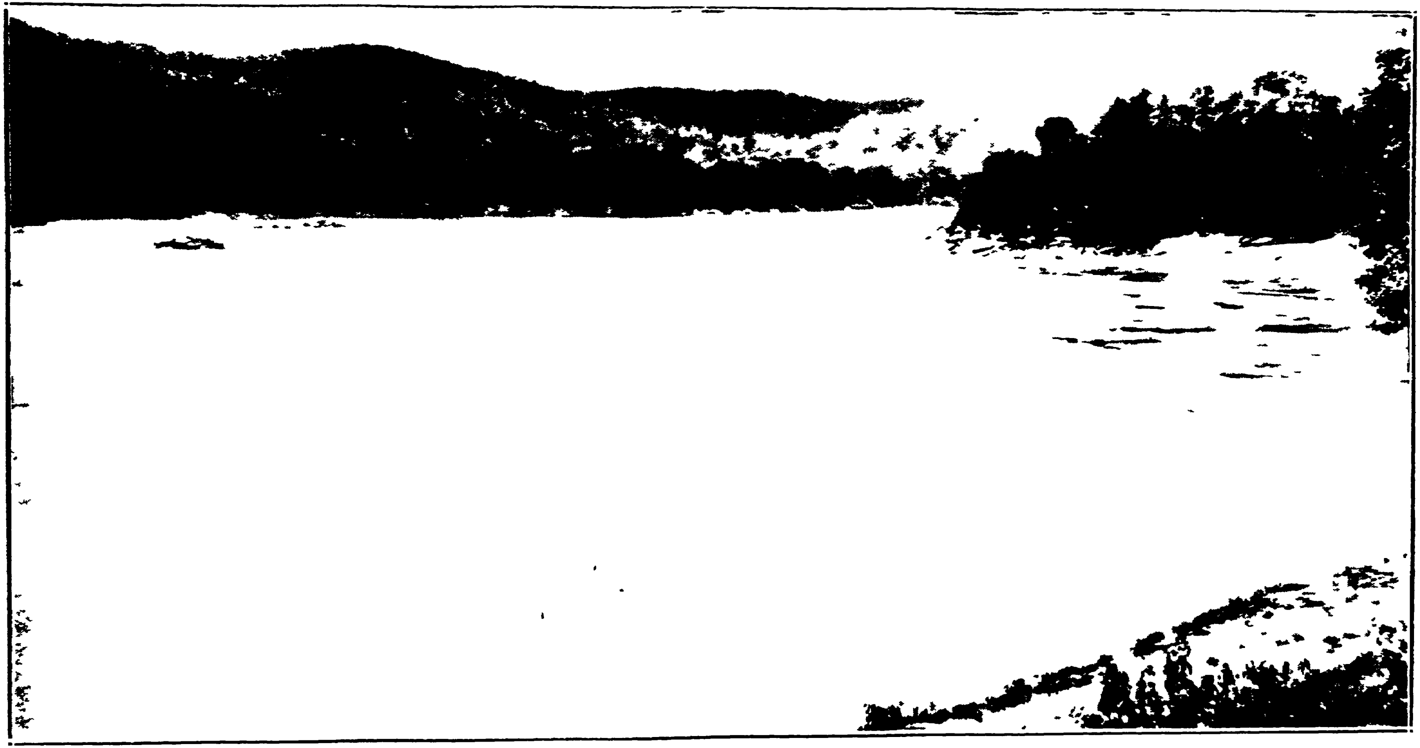

The junction of the Zambesi River and lower arm of the Sanyati River at Kariba Gorge

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

International Forestry Congress, 1926. The proceedings of the First International Forestry Congress, held in Rome in 1926, are being published in the form ot five octavo volumes of about 3,500 pages. These volumes will contain, in addition to a report on the proceedings and resolutions passed at the congress, the whole of the technical reports, numbering about 300, submitted to the various sections of the congress.

At this congress, which was organised by the International Institute of Agriculture, under the presidency of Senator G. Raineri, more than 60 Governments were repre-

sented, while representatives from Universities, forestry schools and scientific institutions attended to the number of over 600. The object of the conference was that of laying the foundation of international co-operation on all problems relating to forestry in its various aspects.

The volumes now being issued probably constitute the most comprehensive collection of papers on European forestry subjects ever published, while the forests of many other parts of the world are dealt with in various directions.

Fuel Supplies for Tobacco Curing.—We would direct special attention to the article which the Forest Officer contributes to this issue of the Journal on the above-mentioned subject. The figures he quotes are arresting and provide much food for thought. He states that to cure the tobacco crop of 1925-26 an area equivalent to at least 13,282 acres of eucalyptus trees would be required. There are no data available as to the average yields of indigenous Savannah forests, and the Forest Officer therefore has had to calculate his figures on the basis of yields from eucalyptus plantations. Eucalyptus trees grow very much quicker than do indigenous trees, and consequently very considerably larger areas of the latter are required than that estimated by the Forest Officer.

Seeing that the tobacco crop now being handled is more than double that of the previous year, a simple calculation will show to what extent deforestation is in progress. It is expected that, given favourable weather conditions, the tobacco crop next year will show further expansion, and the amount of fuel required can be surmised on the basis of the Forest Officer's figures. It is obvious that something must be done to adjust this rapid depletion of the timber resources of the Colony, the effects of which, unless checked, will be disastrous.

The only solution is afforestation, and we owe it to future generations to see that our legacy to them is not a barren waste. The data which the Forest Officer supplies indicate how future requirements of tobacco growers can be provided for, and we trust that his advice will be given effect to. The matter brooks no delay.

Manager's house at Gwebi farm

A Day at Gwebi.—Some forty odd farmers accepted the invitation of the Department of Agriculture to visit the Gwebi Farm on the 14th May to inspect the crops and live stock. About 600 acres were under cultivation this year, of which total maize accounted for 330 acres, lesser areas being planted with ground nuts, sunflowers, beans, oats, potatoes, Sunn hemp, manna, sweet potatoes and majordas. Gwebi experienced an indifferent season, but excellent yields are being obtained, due to the application of proper methods of cultivation. Maize is expected to yield at the rate of 10 bags per acre, while ground nuts are returning 25 bags to the acre. From three and a half acres of potatoes 382 bags of potatoes have been reaped, of which 200 bags are table potatoes. This excellent result was due largely to the planting of seed of good viability, and it is interesting to note that the seed used was stored during the winter months in the manner described in the issue of this Journal for last March. The farmers were escorted round the crops still standing by Mr. C. Mainwaring, Agriculturist, and the farm manager, Mr. E. E. Wright, who explained the cropping system and replied to numerous questions in regard to cultural practice.

The stock at Gwebi consists of a small herd of pedigree Friesland cattle, a few Shorthorns (which are being disposed of), small flocks of Merino, Black Head Persian and Woolled Persian sheep, and pigs, mainly of the Middle White breed. Mr. W. Fleming, Stock Adviser, demonstrated the points of selected specimens of stock, his remarks being followed with the closest interest. During the course of the morning Mr. A. Little, Poultry Expert, held a post-mortem on a fowl, showing clearly how the operation should be carried out. Altogether a very interesting and instructive morning was spent, and it is understood that a visit to Gwebi is to be made an annual event.

In the afternoon, in response to the invitation of the Minister of Agriculture and Lands and Mrs. Downie, a large gathering, which included the Premier, several Ministers and a number of members of the Legislative Assembly, made the journey from town and spent an enjoyable afternoon at the farm, where tea and refreshments were dispensed under delightful conditions.

The Chilled and Frozen Meat Trade.—Messrs. W. Weddell & Co.'s annual review states that importations of frozen and chilled meat into the United Kingdom during 1926 amounted to 930,035 tons, as compared with 886,655 tons in 1925. The increase over the 1925 total was 43,380 tons, or 4.7 per cent.

The average price at which imported meat was sold in 1926, it is stated, was 16 per cent. lower than in 1925, and only 34 per cent. above pre-war level.

The total weight of beef, mutton and lamb exported in 1926 by the various freezing works of the world is estimated at 1,198,600 tons, as compared with 1,338,900 tons in 1925, 1,328,100 tons in 1924 and 1,140,800 tons in 1923.

From a record 1924 total of 476,000 tons the imports of frozen meat into the Continent of Europe last year dropped to 305,500 tons. France took only 60,000 tons, Belgium 53,540 tons, Holland 39,500 tons, Italy 62,559 tons and Germany 123,547 tons. France, Belgium and Italy showed decreases of 50 per cent. or more, and Germany just maintained her importation.

The sale of frozen meat in France suffered a severe setback during the past year as a result of the abnormal economic conditions. About 80 per cent. of the total importations of beef into Belgium were shipped from the Argentine and Uruguay, the remainder coming mostly from Australia. Argentina provided 70 per cent. of the mutton and Australia 30 per cent. Frozen beef prices in Holland opened the year steady, improved in May and June, and then declined in competition with the plentiful fresh supplies, inferior qualities of which were actually cheaper than the frozen for a short period in November. As with most other Continental countries, the frozen meat trade in Italy suffered a very severe setback. A large number of butchers who were selling frozen meat twelve months ago have reverted to fresh meat, the main reason for this being the failure of the chief hay crop of 1926. It should be noted that in 1913 there was no importation of frozen meat into Germany, whereas in 1926, when 123,547 tons were imported, the number of home-grown animals killed in Germany for beef and veal increased by nearly half a million. Frozen meat forms 4 per cent. of the total meat consumption in Germany.

The Land Bank.—The report of the Land and Agricultural Bank of Southern Rhodesia for the year 1926 shows that the number of applications received during the year was 324 for advances, aggregating £342,986, as compared with 365 applications for £420,727 in 1925. The average amount applied for was £1,059. The total number of applications granted during 1926 was 292, amounting to £329,596. of which £218,918 was taken up. It is stated that although the manner in which obligations generally are being met is highly commendable, there is still a tendency amongst a few debtors to consider that because the Bank was instituted by the Government for the benefit of the farming community, liabalities to the Bank may be regarded lightly and of secondary importance in comparison with debts to ordinary creditors. The Land Bank Act, a great portion of which is devoted to setting forth remedies against defaulters, does not give cause for such opinion, and the Board has taken the measures necessary to correct any possible misunderstanding in this respect.

The policy of the Board, as stated in the last report, is to provide the reasonable financial requirements of applicants desirous of carrying out farm development, to meet bonds called up and to relieve farmers of bonds bearing excessive rates of interest or onerous terms of repayment. It is also the aim of the Board to take over gradually all sufficiently secured bonds of farmers desirous of obtaining the easy terms of repayment, even though the rate of interest on such existing bonds may not be onerous.

A statistical return accompanying the report shows that mortgage bonds for a total sum of £67,965 were taken over during the year, of which £41,000 carried interest of 8 per cent. or over.

It is stated that the relationship between the Land Bank and its clients aimed at by the Board is one of closer intimacy than that which exists between the public and the commercial banks. In furtherance of this principle the manager has during the past year visited various centres and a large number of individual farms, and it is hoped that it will be possible to extend this process systematically until practically every applicant feels that he has in the manager a representative on the Board who has that personal

knowledge of conditions which is essential to a sympathetic consideration of any point which may arise.

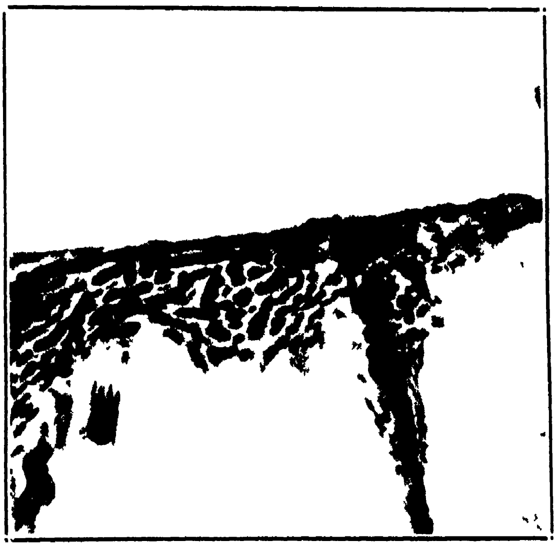
Cotton Growing in Southern Rhodesia.—The *Empire Cotton Growing Review* for April contains the report of Mr. G. S. Cameron, the Corporation's Cotton Specialist in Southern Rhodesia, for the season 1925-26. The report has been published *in extenso* in the daily Press, and it is not necessary, therefore, to do more here than to refer briefly to some of its more salient features. The area planted with cotton in the season under review was 66,086 acres, and the crop looked promising up to the middle of March, when heavy rains set in and did much damage to the stands. There was a general weakening of the plants, which rendered them more susceptible to insect attack, particularly jassid and red stainers. Flower and boll shedding became very severe. Despite this setback it looked as if there might be a fair crop ready for picking about the middle of May, but it was eventually found that the bolls failed to open out properly, and a crop far less than was expected was reaped. The previous year was the wettest on record, and the cotton crop thus suffered from the cumulative effect of the two seasons.

Bad as the conditions were, Mr. Cameron considers that it should have been possible to produce more and better cotton than was grown had the Colony been in possession of a better seed supply and possibly a better variety of cotton. He remarks that the work of selection and the investigation of new varieties is being continued at the Cotton Breeding Station, Gatooma, where promising results have been recorded.

Dealing with the present season, Mr. Cameron's report was written too early to give any estimate of the cotton crop, but he states that, despite the quality of seed planted, germination appeared to have been fairly regular. We can supplement what is written by stating that approximately 13,000 acres were planted with cotton this season, and that on the whole the weather conditions have been favourable. A rough estimate has been given of 1,000 bales of lint.

Mr. Cameron draws attention to the beneficial results obtained by planting maize after cotton, and for this reason

A new species of Rhodesian cheetah



Showing well developed mane, which is totally absent in the leopard

it would appear that cotton will find a permanent place in the farming practice of this Colony in those areas where it is likely to succeed."

Mr. Cameron thanks the farming public for the many kindnesses received while in their midst. We feel sure we are voicing the opinion of farmers in expressing their appreciation of the splendid work which the Empire Cotton Growing Corporation is doing to establish the cotton growing industry in this Colony, and their indebtedness to Mr. Cameron and his staff for the valuable assistance which they have ungrudgingly given them.

The Rhodesian Cheetah—A New Species.—The discovery of a large mammal new to science is a rare event to-day, when nearly every country in the world has been explored by white men. That an animal comparable with the leopard in size, with markings both beautiful and conspicuous, but strikingly different from either leopard or cheetah, should be discovered in Southern Rhodesia is indeed remarkable. This country has been occupied for nearly 40 years, and was hunted over long before the occupation, yet only quite recently has the presence of the Rhodesian Cheetah been brought to light.

The history of the discovery is as follows:—Some time ago Mr. Donald Fraser sent a skin to Mr. C. Wilde, taxidermist to the Salisbury Museum. Mr. Wilde at once saw that he had something unique, and brought it to the notice of his committee. Mr. Donald Fraser was approached and, though reluctant to part with so splendid a trophy, generously presented it to the museum in the interests of science. When Major A. L. Cooper became a member of the museum committee he took the matter up, had the skin photographed and later sent it to the British Museum to be identified. He also took a lot of trouble to ascertain if there were other records of the animal. Dr. R. I. Pocock published an article on the new cheetah in "The Field" for 14th April, 1927, from which the following extracts are taken: "Evidence collected by Major Cooper shows that five skins taken from animals killed at various times and in different places in Rhodesia are in existence, that the species

has been known for many years to the natives . . . and to some Europeans, and that it is like a cheetah in character and its non-arboreal habits." "The animal is a cheetah in all its external characters, differing only from the common cheetah, which is thickly covered all over with small solid spots, in the boldness of its pattern of thick, black, mostly longitudinal stripes, blotches and loops set off by a cream-buff background." "The paws are in every respect identical with those of the common cheetah, and entirely different from those of a leopard."

Dr. Pocock described this animal in a recent number of the Proceedings of the Zoological Society and named it *Acinonyx rex*, "to emphasise the splendour of its livery."

The photos reproduced opposite were taken by Major Cooper before he sent the skin to England. The characteristic markings and the mane on the neck are well shown.

The original skin is being returned to the Salisbury Museum, and the British Museum is very anxious to secure good specimens. Publicity is here given to the subject in the hope that readers of this Journal will take an interest in the matter. Reports of the presence of *A. rex* in any district would be welcomed by the museum committee, and it is hoped that more and better prepared skins may be secured for presentation to the British Museum. Skulls or complete skeletons would be of great scientific value, and notes as to habits from native or other sources would be appreciated.

Live Stock Statistics, 1926.—We publish elsewhere in this issue of the Journal statistics of live stock and animal products for the year 1926. From these it will be seen that European-owned cattle have decreased by 1.4 per cent., and, allowing for returns still to come in, they number 991,216. Native-owned cattle have increased by 9.3 per cent. during the year and total 1,197,466 head. The Statistician attributes the decrease in the number of cattle owned by Europeans to reduction in the number of bulls in use and also to the practice of spaying cows. His figures show that the total of deaths, exports and cattle consumed in the Colony exceeded the natural increase by 29,849 head, and he points

out that unless immediate attention is given to this subject by cattle owners, not only will it be impossible to increase the exports of the Colony, but it will be difficult to maintain the present total. This is not a pleasant state of affairs, and indicates the check which the pastoral industry of the Colony has received as a result of the slump in prices during the past few years. It is some consolation to note that in the year under review there were more bulls in use than in 1925 and that the number of calves born was greater than in the previous year; but it is obvious there will have to be a much higher rate of increase if our export trade is to be maintained. The natural law of supply and demand will probably overcome this difficulty, and already prices have hardened as a result of markets which have been created overseas and to the north of us. In one respect the decrease in the number of cattle held by Europeans is a matter for satisfaction, in that the heavy sales of the past year have cleared the Colony of much of its scrub stock. In the process of selling off, however, a good deal of useful breeding stock found its way to the slaughter houses, and it will take some time to make up the leeway. The experience of the last few years has brought it home very forcibly to stock owners that it does not pay to breed scrub stock. Even when prices were at their lowest, stock of good quality could be sold at a profit, and nobody realises better than the Rhodesian cattle owner to-day that numbers alone will not suffice. There is a big demand in the Colony at the present time for good bulls, which unfortunately are difficult to procure. That they will be procurable before long we have reason to believe, and we hope then to see a wholesale scrapping of the nondescript bull so often met with.

It is pleasing to note from the statistics that the total number of pure-bred cattle in the Colony has increased by 6.3 per cent. Herefords still top the list, but Frieslands are a good second and now total 1,990 head. It would, we consider, be a good thing if the number of breeds represented in the Colony was not so numerous, for we see that in a total of 11,500 head of pure-bred cattle there are no less than twelve different breeds.

Statistics are given this year of the number of persons employed in farming, from which it will be noticed that

there are approximately 4,000 European males and 1,346 European females so engaged. The number of native males employed is given as 75,000.

It will be observed that the Statistician still has difficulty in getting farmers to render their returns on the due date. This causes delay in the publication of the statistics, and we would once again urge all concerned to give the matter particular attention.

Correction.

THE HANDLING, GRADING AND BALING OF CURED VIRGINIA TOBACCO.

On page 510 of May Journal, thirteenth line from top of page, read "bright" for "other." Page 515 of same issue, second line from bottom of page, read "The operation of bulking," etc.

Forestry in Southern Rhodesia.

TIMBER AND FUEL FOR TOBACCO GROWERS.

YIELDS FROM *EUCALYPTUS ROSTRATA* AND *EUCALYPTUS TERETICORNIS*.

By J. S. HENKEL, Forest Officer.

In the article entitled "Timber and Fuel for Tobacco Growers," which appeared in the *Rhodesia Agricultural Journal* for February, 1925, it is stated under the heading "Yields" that "Data in regard to yields are insufficient to prescribe the area which will be necessary to supply a given quantity of fuel each year. As a rough guide it is estimated that on an average an acre of eucalyptus trees will yield ten cords of fuel wood in five years. On this basis, if a tobacco grower requires 60 cords of fuel per annum he will require to plant six acres each year for five years. It is probable that the yield from the coppice growth will be very much greater than that estimated."

"It is advisable to plant an area larger than the estimated requirements, for the larger the area the wider is the choice in regard to the future management of the stands."

The estimate of the yield is based on the growth in this Colony of the kinds specified in the article referred to and in localities where tobacco is grown. Some species of eucalypts grow faster than others, but the yield per acre of all depends on the quality of the soil, climate, age, and number of trees on the ground. A good site may, through an unfavourable planting season, carry a poor stand.

For a wide range of conditions in the tobacco growing localities experience gained with various species of eucalypts indicates that two of them, namely, the red gum (*Eucalyptus rostrata*) and the forest red gum (*Eucalyptus tereticornis*), while not as fast growing as the saligna gum or the botryoides gum, are comparatively easily established, and with ordinary care and attention produce a fuel wood of high calorific value as well as a hardwood timber suitable for many purposes.

Plots of these two species (usually mixed) are scattered throughout the Colony. Some are in good situations, others in poor, but in nearly all cases the species are persistent growers, adapting themselves to the wet seasons, and apparently seem indifferent to seasons of low and irregular rainfall. Few trees possess this remarkable power.

Trees raised from seed imported from Australia developed into a number of growth forms: some with numerous crooked branches approximating the weeping willow in shape; others with upright stems and fastigiate habit like the Lombardy poplar. Between these two extremes there are many intermediate forms. Because of the abundance, in the earlier plantings, of the undesirable forms, a prejudice arose against the tree. It is unreasonable to maintain this prejudice, for by gathering seed from carefully selected trees having good shape and rapid growth, a generation is being raised in which the greater portion of the crop consists of good shaped trees. Examples may be seen in the splendid plots on the Ruia Estate (Bracewell) and Kilmuir (Watson).

By continuing the selection of seed from the best trees and destroying the undesirable types, a tree of high quality will inevitably result.

The red gum and forest red gum plantations in the Colony have received such varying treatment—from absolute neglect to over-cutting or over-thinning—that it is difficult to organise into a yield table the data collected in regard to volume production.

In these circumstances it is felt that a statement of some measurements made in different localities would afford at least an indication of what may be expected and thus be of assistance to those who contemplate producing their own fuel requirements.

EXAMPLE I.

A plantation of mixed red gum and forest red gum, Ruia Estate (Bracewell). Unthinned. Original espacement 3 feet x 3 feet. Age 7 years. Volume per acre, over-bark measurement.

Diameter in inches. B.H.	Number of trees.	Height in feet.	Volume in cubic feet per tree.	Volume in cubic feet per acre.	Remarks.
2	230	20	0.273	62.79	Mean annual increment, cubic feet per acre = 343.
3	320	29	0.8	256.00	
4	330	37	1 76	580.80	
5	160	44	3.00	480.00	Mean annual increment, cords (80 cubic feet) per acre = 4.2.
6	190	51	4.4	836.00	
7	30	58	6 2	186 00	
...	1,260	. .	...	2,401.59	

Cords (80 cubic feet)—30.

EXAMPLE II.

A plantation of mixed red gum and forest red gum, Uplands Estate, Marandellas. Thinned. Original espacement 6 feet x 3 feet. Age 7.6 years. Volume per acre, over-bark measurement.

Diameter in inches. B.H.	Number of trees.	Height in feet.	Volume in cubic feet per tree.	Volume in cubic feet per acre.	Remarks.
2	20	...	0.18	3.60	Mean annual increment, cubic feet per acre=240.
3	40	25	0 70	28.00	
4	90	36	1.58	142.20	
5	200	42	2.65	530.00	
6	160	45	3.85	616.00	Mean annual increment, cords per acre=3.
7	70	...	5.10	357.00	
8	10	...	6 30	63.00	
9	...	...	...	...	
10	10	...	8.9	89.00	
...	600	...	...	1,828	

Cords—22.7.

EXAMPLE III.

A plantation of mixed red gum and forest red gum, Uplands Estate, Marandellas. Unthinned. Original espacement 3 feet x 3 feet. Age 8.6 years. Volume per acre, over-bark measurement.

Diameter in inches B.H.	Number of trees.	Height in feet.	Volume in cubic feet per tree.	Volume in cubic feet per acre.	Remarks.
2	260	23	.18	46.80	
3	280	29	.65	182.00	Mean annual increment, cubic feet = 228.
4	140	33	1.45	203.00	
5	170	38	2.48	421.60	
6	180	44	3.7	666.00	
7	60	49	5.0	300.00	Mean annual increment, cords = 3.2.
8	10	54	6.3	63.00	
9	10	58	7.7	77.00	
...	1,110	.	...	1,959.40	

Cords—28.

EXAMPLE IV.

A plantation of mixed red gum and forest red gum. Forest Nursery, Salisbury. Lightly thinned. Original espacement 6 feet x 6 feet. Age 13 years. Volume per acre, over-bark measurement.

Diameter in inches B.H.	Number of trees.	Height in feet.	Volume in cubic feet per tree.	Volume in cubic feet per acre.	Remarks.
1	40	Mean height of plot = 58 feet.	Mean sample tree, 4.92 cubic feet, 5.6 inches diameter.	3,590	
2	160				
3	130				Mean annual increment, cubic feet = 276.
4	50				
5	40				
6	40				
7	90				Mean annual increment, cords = 3.4.
8	70				
9	70				
10	40				
...	730	...	...	3,590	

Cords—45.

The average mean annual increment of the four plots is 272 cubic feet. If it be assumed that the growth is equal each year and that on a reasonably well stocked area the mean annual increment is 270 cubic feet, then an acre of plantation at different ages should contain the following volumes: —

At 5 years	1,200 cubic feet,	or	15	cords
At 6 years	1,470 cubic feet,	or	18.3	cords
At 7 years	1,740 cubic feet,	or	21.7	cords
At 8 years	2,010 cubic feet,	or	25.1	cords
At 9 years	2,280 cubic feet,	or	28.5	cords
At 10 years	2,550 cubic feet,	or	31.8	cords

These volumes include a proportion of small material, which may be considered too small to use for heating the curing barns, but it can be used for tobacco sticks or fuel for domestic purposes.

It is important to bear in mind that these estimates are based on stands that are well stocked and growing under good conditions. In any extensive planting operations, poorly stocked areas are inevitable owing to poor soil conditions, bad seasons and accidents of various kinds.

If plantations are established purely for fuel purposes it is not necessary to make any thinnings, but if they are to be managed for the production of timber in addition to fuel, then the article already referred to should be consulted as to procedure.

A tobacco grower naturally will have a fair idea of the land available and suitable for the tobacco crop as well as the area he can handle annually. He will also know roughly the quantity of indigenous wood available and its probable duration. From this knowledge he can estimate his probable fuel requirements, take steps to husband his existing fuel supplies and by means of plantings of eucalyptus trees produce all he may need in future years.

From the data given, an estimate can be made of the area fuel plantations should occupy in order to supply a given volume annually. For example: If a volume of 60 cords per annum is required, and using a five-year rotation, there should be 20 acres of plantation, of which 4 acres is one year old, 4 acres two years, 4 acres three years, 4 acres

four years, and 4 acres five years. The crop on the five-year-old plot would be cut during the summer when it is wanted, and should be removed from the felling area and stacked. This is necessary to prevent injury to the coppice growth which will appear and grow vigorously during late summer and early winter. If longer rotations are required (which are advisable), the areas corresponding to each can be ascertained from the table.

Owing to the uncertainty of the planting seasons, it is advisable to plant larger areas than are actually required. Every advantage should be taken of good seasons. At a later stage, by arranging the fellings, a normal series of age gradations can be brought about.

Where climatic and soil conditions are specially favourable, the faster growing trees, such as the Sydney blue gum (*E. saligna*) and the botryoides gum (*E. botryoides*), can be grown.

It is generally conceded that the tobacco industry has a great future. The crop of Virginia tobacco handled during 1926 amounted to 5,313,186 lbs. In the curing of this tobacco it is estimated that one cord of fuel wood is required for every 200 lbs. weight. This means that ·26,565 cords were used. On a basis of 80 cubic feet equals one cord, the equivalent volume in cubic feet amounts to 2,125,200. No doubt a proportion of the fuel used was obtained from the clearing of land to be used for agricultural purposes, but the probability is that the greater quantity was cut in the Savannah forests. If the cultivation of tobacco is to be extended, as seems probable, it is imperative that adequate steps be taken to husband existing resources. Economical methods of using fuel should be evolved. It would appear that two-fifths of a cubic foot to cure 1 lb. of tobacco is excessive. The deforestation of extensive areas inevitably will have a disastrous effect on the climate of the country, and it is earnestly urged that steps be taken to re-afforest denuded areas.

To supply annually the fuel requirements from eucalyptus wood for a tobacco crop similar to the 1926 one needs an area of at least 13,282 acres. A tobacco crop four times the volume will need 53,128 acres.

Should for some reason tobacco growing become unprofitable, the plantations primarily established for fuel supplies can be managed for timber production, and as such are a profitable investment. In the planting of trees there is thus a gain every way.

Those farmers who have planted trees are planting more. They would not do this unless it paid them. All can plant trees.

Poultry Husbandry.

AN INTERESTING POST-MORTEM.

The Poultry Expert recently received a Rhode Island Red cock for *post-mortem*. This bird was found dead in the run. No external marks of injury were apparent. On opening up the bird it was noticed that all the organs were congested and that there was clotting of blood in the blood vessels, pointing to snake poison, although no mark of a bite was found on the bird.

It was noticed that the stomach was larger than usual, and on cutting into it the scales of a snake were noticed. The incision was enlarged, and with a forceps (there was snake venom in the stomach) a young cobra, 1 ft. 10 ins. long and the thickness of one's thumb at its thickest part, was carefully drawn out. The tail was in the gullet and the head in the gizzard. There were marks of bruising on the body where it had been trampled upon and pecked by the bird, but whether it was alive or dead when swallowed it is difficult to say.

Statistics of Live Stock and Animal Products for the Year 1926.

By A. Borradaile Bell, Statistician.

In presenting these statistics on the live stock of the Colony for the year 1926 it is much to be regretted that for the first year since statistics were collected there is a decrease in the total number of European owned cattle in the Colony, more especially as this occurs just as a greater demand for live stock for consumption abroad has been created. Although the number of stock exported increased during the year by 14,000 head, there has been no corresponding increase in breeding, for an examination of the figures discloses the fact that the total of deaths, local consumption and exports exceeded the natural increase by 29,849 head, and therefore, unless immediate attention is given to this subject by cattle owners, not only will it be impossible to increase the exports of the Colony, but it will be difficult to maintain the present total.

Native-owned cattle show an increase of 101,625, or 9.3 per cent., and if the immediate demand is to be met it would appear that it will have to be drawn largely from this source.

The decrease is attributed to the reduction in number of "bulls in use" and also to the practice of spaying cows, factors which were commented on in the reports for 1924 and 1925; and it is satisfactory to note that in the year under review there has been an increase in "bulls in use" as well as in the number of "calves under one year," due no doubt to the improvement of the cattle market. But there will have to be a much higher rate of increase before a regular and increasing supply can be assured for export purposes. Under the circumstances it might normally be

expected that there would be a considerable expansion of the cattle industry during the current year; but the drought in Matabeleland and the southern part of the Colony generally has to be taken into account, and as a result there will probably be an increase in deaths from poverty in the areas affected, as well as probably a lower birth rate.

The position in regard to stock other than cattle remains the same. The total figures from returns received are in all cases slightly less than last year, and an estimate of the returns outstanding only brings them roughly up to last year's totals.

With regard to dairy products, an attempt was made this year to obtain the amounts produced instead of the amounts sold, but very few farmers appear to have any idea of the amount of eggs, butter, etc., produced and used for consumption on the farm, and in future the practice of obtaining figures only for products sold will have to be reverted to. Although the figures given in the attached tables include in some cases products consumed on the farm, still, despite the fact that the total number of live stock in the country shows a decrease, the dairy and kindred industries show a quite considerable advance in production.

Last year an attempt was made to obtain figures of all owners of cattle and other live stock residing in towns and adjacent plots and using the commonages for grazing, and this has been continued. The results, however, are not very satisfactory, and until other machinery for collecting these returns is available, the information will not be complete. In future this office will concentrate mainly on obtaining returns from such persons as are plot owners with 10 acres of crops or over, or dairymen and others who are owners of cattle on a commercial scale. After all, the figures given in these reports purport to represent the stock owned by farmers, and persons residing in towns or suburbs and keeping one or two cattle and a few fowls for their own use can hardly come under this category. There are other owners of live stock, such as transport drivers, miners, etc., from whom returns are not received, and a complete census of all the stock in the country must await the quinquennial census, with its more elaborate staff and machinery for obtaining returns.

Cattle.—The total cattle owned by European farmers in the Colony from returns received is 969,216, and an estimate of the outstanding returns accounts for a further 22,000, bringing the total to 991,216, a decrease of 14,870 head. This decrease has already been commented on.

The annual "local consumption" in the Colony amounts to 82,785 head, 73,065 being slaughtered under butchers' licences and 9,720 for consumption on farms.

The total number of deaths recorded was 47,449, or a death rate of 4.9 per cent. As, however, a certain number of farmers have been unable to give details under this heading and many have omitted young calves, the rate is really slightly higher.

The deaths are distributed as follows:—21,442, or 2.2 per cent., were due to disease, with which is included "veld poisoning"; 15,811, or 1.6 per cent., are attributed to poverty and old age; and 10,196, or 1 per cent., to wild animals and accidents, including dip poisoning.

If the total number of animals accounted for by exports, local consumption and deaths are deducted from last year's total number of cattle, and to the result the number of calves under one year is added, a total of 976,237 cattle is arrived at. This is 7,021 head in excess of the total shown in the accompanying tables, or an error of about .7 per cent. Considering that all returns have not been received, and further, that "cattle lost or stolen" have not been taken into account and that the death rate should be slightly higher, the small error is evidence that on the whole the returns may be considered as accurately representing the cattle industry.

The total number of cattle owners from returns received, exclusive of commonage owners, is 2,424, to which must be added 105 whose returns are outstanding, making a gross total of 2,529. Of this number 1,635 had herds of under 250 head and 524 had between 250 and 500 head.

The following table shows the number of owners of herds of over 500 head. Although the number of cattle owners has increased by 133, the number owning 500 head and over has decreased by 13:—

Over 50 under 1,	1,000 to 2,000.	2,000 to 3,000	3,000 to 4,000.	4,000 to 5 000	5,000 to 10,000	10,000 to 20,000.	20,000 to 40,000.	Over 40,	Total
235	84	21	10	7	6	5	1	1	370

The total number of native-owned cattle from statistics supplied by the Native Department is 1,197,466, an increase of 101,625 head, or 9.3 per cent.

The following table gives the total cattle in the Colony at 31st December in each year:—

CATTLE, 1917-26, AS AT 31st DECEMBER.

Year.	European owned cattle.	Native-owned cattle.	Total cattle.	Net annual increase or decrease per cent.		
				European-owned cattle.	Native owned cattle.	Total cattle.
1917	532,311	551,632	1,083,943	13.6	12.2	12.9
1918	600,447	610,100	1,210,547	12.8	10.6	11.7
1919	678,508	652,776	1,331,284	13.0	7 0	10.0
1920	772,891	744,402	1,517,293	13.9	14 0	14 0
1921	905,040	845,498	1,750,538	17.1	13.6	15.4
1922	936,251	864,894	1,801,145	3.4	2.3	2.9
1923	993,608	927,343	1,920,951	6.1	7.2	6.6
1924	1,003,629	1,005,277	2,008,906	1.0	8.4	4.6
1925	1,006,086	1,095,841	2,101,927	0.02	9 0	4.6
1926	991,216	1,197,466	2,188,682	—1.4	9.3	4.1

The following table gives the composition of the herds as compared with 1925, and it will be noted that there is a considerable decrease in young stock, excluding calves under one year. Heifers are 15,450 less, yearling oxen 4,055 less and untrained oxen (which include some yearlings) 24,422 less.

Cattle	1925.		1926	
	Totals.	Per cent.	Totals.	Per cent.
Cows ...	320,237	31.8	313,671	32.4
Heifers over one year ...	148,823	14.8	133,373	13.8
Calves under one year	161,115	16.1	175,206	18.1
Bulls in use ...	8,970	0.9	9,469	1.0
Other bulls	3,827	0.4	2,508	0.3
Trained oxen ...	124,249	12.3	124,601	12.8
Untrained oxen	150,934	15.0	126,512	13.0
Yearling oxen	87,931	8.7	83,876	8.6
Totals	1,006,086	100.0	969,216	100.0
		Unclassified	22,000	
			991,216	

Exports and Imports.—The figures here used are those supplied by the Veterinary Department.

The total number of cattle exported during the year was 74,821, an increase of 14,278 on the total for 1925. Of these, approximately 50,000 were for export overseas and 12,000 for local consumption in the Union of South Africa, while 310 head were exported on the hoof.

Trade with the Belgian Congo shows a total decrease of 2,575 head. The number of animals exported to this market for slaughter purposes has been nearly doubled, but the demand for breeding stock has fallen off very considerably.

Imports into the Colony of breeding stock have decreased slightly.

IMPORTS.

Country of origin.	1924.		1925.		1926.	
	Bulls.	Cows and heifers.	Bulls.	Cows and heifers.	Bulls.	Cows and heifers.
United Kingdom ...	...	...	15	...	...	..
Union of South Africa	227	419	423	687	405	611
Totals	227	419	438	687	405	611
Grand totals	646		1,125		1,016	

EXPORTS.

Country of destination.	1924.			1925.			1926.		
	Slaughter	Breeding.	Trek.	Slaughter.	Breeding.	Trek.	Slaughter.	Breeding.	Trek.
England	..	...	...	236	...	...	310	...	...
Union of South Africa	46,407	...	...	45,266	...	...	61,845	...	...
Congo	...	3,404	.	4,768	9,269	383	9,016	2,829	.
Northern Rhodesia	490	51	..	...	85	...	...	32	...
Portuguese East Africa	.	388	30	209	324	3	584	2	203
Nyasaland	...	...	...	...	...	...	...	...	...
Totals	46,897	3,843	30	50,479	9,678	386	71,755	2,863	203
Grand Totals	50,770			60,543			74,821		

Pure-bred Cattle.—The total pure-bred cattle in the Colony amount to 11,500, an increase of 683, or 6.3 per cent., and this increase is reflected in every breed except North Devons, which have decreased in number. The decrease in this breed is largely accounted for by a reduction of 57 head in one herd, while 42 head were entered twice last year, having been shown on two returns in error. The greatest increase is in Frieslands, which now take second place with a total of 1,990 head. Of this total, 1,190 are cows, which is a total of 251 cows ahead of any other breed. Shorthorns show only an increase of 73, and have dropped from second to fourth place. Excluding Africanders, whose title to being pure-bred is always somewhat doubtful, Aberdeen Angus, Sussex and South Devons are the three breeds which, next to Frieslands, show the greatest increase.

COMPOSITION OF PURE-BRED HERDS.

Cattle (Pure-bred).	1925.		1926.	
	Totals.	Per cent.	Totals.	Per cent.
Cows	3,637	33.6	3,960	34.4
Heifers over one year ...	1,434	13.3	1,565	13.6
Calves under one year	1,865	17.2	1,992	17.3
Bulls in use	3,229	29.9	3,296	28.9
Other bulls	652	6.0	687	5.8
Totals	10,817	100.0	11,500	100.0

PURE-BRED CATTLE ACCORDING TO BREEDS.

Breed.	1925.				1926.			
	Bulls.	Calves.	Cows.	Total.	Bulls.	Calves.	Cows	Total.
Hereford	833	365	806	2,004	886	369	818	2,073
Friesland	355	344	1,063	1,762	381	419	1,190	1,990
Africander	548	354	806	1,708	546	371	939	1,856
Shorthorn	708	280	805	1,793	747	266	853	1,866
Aberdeen Angus ..	380	99	352	831	398	140	417	955
North Devon .	334	134	484	952	256	125	404	785
Sussex	256	137	221	614	287	111	294	692
South Devon	238	85	255	578	254	82	318	654
Red Lincoln	171	56	191	418	150	79	214	443
Red Poll .	49	11	49	109	51	26	64	141
Ayrshire	11	.	24	35	18	4	14	36
Other Breeds	9		4	13	9	.		9
Totals	3,892	1,865	5,060	10,817	3,983	1,992	5,525	11,500

Live Stock other than Cattle.—Figures given of native-owned stock are from estimates supplied by the Native Department. The imports and exports under this heading are those given in the annual statement issued by the Department of Customs and Excise of the Union of South Africa.

Horses, Mules and Donkeys.—The number of these animals on farms does not vary to any appreciable extent.

Allowing for an estimate of the returns outstanding, horses show a slight increase, while mules and donkeys are rather less than in 1925.

The imports under this heading were:—Horses 352, mules 392, and donkeys 589, all from the Union of South Africa. The exports are negligible.

The total deaths are given as: Horses, 131, or 5.5 per cent.; mules, 79, or 5.1 per cent.; and donkeys, 447, or 4.4 per cent.

In addition to the figures in the attached table there are a considerable number of horses, mules and donkeys owned by persons other than farmers. The B.S.A. Police alone account for a further 326 horses, 217 mules and 332 donkeys. The natives in the country own 163 horses, 130 mules and 25,375 donkeys; and animals owned by transport riders, miners and persons living in urban areas would be quite an appreciable number.

Sheep.—The number of sheep owned by European farmers is 66,236, a decrease of 1,668, or 2.4 per cent.; and native-owned sheep are 265,458, a decrease of 15,391, or 5.5 per cent.

Of the sheep owned by European farmers, 7,597 are classified as Merino.

The deaths amongst European stock were as follows:—

Disease (including veld poisoning) ...	5,048
Poverty and old age	1,184
Accident and wild animals	1,039
Total	7,271 = 11.4%

The local consumption is 28,293, of which total 25,070 are slaughtered under butchers' licences and 3,223 for consumption on farms.

Imports amounted to 12,706, an increase of 2,105; while the exports, mainly to Northern Rhodesia and the Belgian Congo, were 3,354, an increase of 2,697.

The total number of farmers owning sheep was 735, or 27 per cent., and of these, 219 or 8 per cent. have herds of 100 and over.

Goats.—

European-owned ...	14,613	decrease of 702, or 4.5%
Native-owned	750,768	increase of 25,019, or 3.4%
Total	765,381	

The deaths amongst European-owned stock were 1,183, or 8.1 per cent.; the local consumption was 6,194, of which 4,678 were slaughtered by butchers and 1,516 consumed on farms.

Imports amounted to 4,132, an increase of 1,004, and exports to 847.

Pigs.—This stock shows a slight increase of 229, the total being 20,385. Pigs owned by natives amount to 35,932, making a total for the Colony of 56,317.

The deaths amongst European-owned stock only were:

Disease	425
Poverty and old age	28
Wild animals and accident ...	254
Total	707 or 3.4%

The local consumption of pigs is made up as follows:—

Bacon factories	7,417
Butchers	4,473
Farms	1,630
Total	13,520

This is a large proportion of the total stock in the Colony, even allowing for pigs owned by natives, and in addition to the above, 2,705 were exported, mainly to the Belgian Congo. The imports only amounted to 52.

The number of farmers owning pigs was 1,223, or 44 per cent. of farmers. Of this number, 578, or 21 per cent., had 10 and over.

Poultry.—The total poultry owned by farmers is 157,288, which is 7,231 less than last year. It is satisfactory to note that the production of eggs has increased. As, however, a large number of poultry owners reside in urban areas, most of whom are not included in the above, it is obvious that this total does not accurately represent the number of poultry in the Colony. The number of poultry owners amongst farmers is 1,929, or 70 per cent., and of this, 259 had 500 birds and over.

Animal Products.—The improvement in the dairying and kindred industries has already been commented on, and, despite the fact that under all headings a proportion of the increase is due to the production having been given, and not just sales, as in previous years, there is an appreciable advance in all branches of this industry. An estimate of the outstanding returns, based on returns for 1925, has been included in the totals given. An estimate of the value obtained by farmers for their products under this heading is approximately £250,000.

Eggs.—The total for this industry, exclusive of some persons resident in urban areas, is 375,225 dozen eggs, an increase of 67,067 dozen.

There is a considerable increase in both imports and exports of this commodity, and the price of the exports averages slightly more than in 1925, while the price of the imported article averages rather less. The total eggs imported were 47,080 dozen, and the average price was 1s. 6d. per dozen. The exports amounted to 75,197 dozen, and the average price was 2s. 1d. per dozen. The majority of the exports were to the Congo.

The number of farmers who sell eggs as part of their farming operations is 1,128, or 58 per cent. of those who have poultry. Of this number, 159, or 8 per cent. of poultry owners, produced 500 dozen and over.

Cream.—The figures in connection with this commodity are still unsatisfactory. According to the returns, farmers produced 618,068 lbs. of butter fat and 594,740 lbs. of cream, and if the latter is taken as 45 per cent. butter fat, the total butter fat sold would be 885,701 lbs., as against 968,160 lbs. purchased by the creameries. The increased production by

farmers, without allowing for this discrepancy, is 200,254 lbs., or 29 per cent. In addition to the cream sold to creameries in the Colony, a further 22,053 gallons, valued at £6,155, was exported to the Union of South Africa.

Farmers selling cream totalled 793, or 32 per cent. of cattle owners.

Milk.—The production of milk during the year amounted to 1,232,170 gallons, as compared with 621,357 gallons in 1925, or an increase of nearly 100 per cent. This abnormal increase can only be due to farmers having, in a greater proportion of instances than in the case of other dairy products, given their production as opposed to sales.

Butter.—Farm butter produced during the year amounted to 438,443 lbs., and that produced by the creameries to 1,168,847 lbs., making a total for the Colony of 1,607,290 lbs., an increase of 15 per cent. on that for 1925. In the case of farm butter, the increase was 44,904 lbs., or 11 per cent., and in creamery butter 165,997 lbs., or 16 per cent. As a result of this increased production there was a considerable rise in exports. In 1925 the amount exported was 560,746 lbs., and in the year under review 775,023 lbs., an increase of 214,277 lbs. The value of the butter exported averaged 1s. 5¼d. per lb., against 1s. 3¾d. in 1925. The imports also rose during the year, but the total of 33,200 lbs. is not of much significance. The number of farmers who produced butter on farms is 672, or 26 per cent. of those owning cattle.

Cheese.—Cheese manufactured on farms was 153,040 lbs., as compared with 130,768 lbs. in 1925, an increase of 22,272 lbs.

The exports rose from 23,955 lbs. to 58,973 lbs., of which nearly 50 per cent. went to the Union of South Africa. The imports rose from 80,739 lbs. to 160,962 lbs., and of this amount 140,000 lbs. was either from Bechuanaland or the Union of South Africa. The rather abnormal rise in imports is partly accounted for by the fact that during the year there was a temporary surplus of cheese in the Union which lowered the price very considerably, and doubtless merchants took advantage of the opportunity to buy in more than normal requirements. The number of farmers making cheese is 46.

TABLE No. 1.

District.	Total cattle.	Cows.	Heifers over 1 year.	All calves under 1 year.	Bulls in use.	Other bulls.	Oxen. Trained.	Oxen. Untrained.	Yearling oxen (tollies).
Wankie	8,452	2,618	1,219	1,493	55	4	1,379	952	732
Nyamandhlovu ...	16,758	5,230	2,243	2,788	115	153	2,822	2,044	1,363
Bulalima-Mangwe ...	48,650	17,261	6,507	9,968	485	216	2,616	6,699	4,898
Matobo	20,521	7,114	2,942	3,811	163	78	1,723	2,756	1,934
Umzingwane ...	13,952	4,795	1,999	2,740	119	17	1,219	1,917	1,146
Bulawayo ...	12,743	4,454	1,847	2,196	122	53	1,893	1,224	954
Bubi	44,498	15,143	5,436	8,468	399	304	4,752	6,585	3,411
Sebungwe	658	150	100	72	1	...	319	16	...
Gwelo	62,730	19,692	7,901	10,962	580	111	11,031	6,907	5,546
Selukwe	22,939	7,374	3,240	4,621	242	64	3,609	2,501	1,288
Insiza	64,661	22,631	9,873	12,679	811	214	4,731	10,440	3,282
Gwanda	43,532	15,417	6,046	8,539	514	145	1,073	4,608	7,190
Belingwe	34,658	11,881	4,820	6,743	342	51	2,693	3,405	4,723
Victoria	46,856	13,731	7,592	7,305	394	164	6,666	6,597	4,407
Chilimanzi	38,414	11,660	7,220	7,158	503	82	1,745	6,831	3,215
Hartley	55,229	17,197	6,740	9,065	458	123	11,526	5,589	4,531
Lomagundi	41,956	12,068	4,686	6,809	281	53	11,271	3,316	3,472
Mazoe	46,101	11,296	4,752	5,614	276	61	18,415	2,890	2,797
Salisbury	48,678	14,410	6,435	7,811	361	155	12,298	3,814	3,394
Marandellas ...	26,937	8,337	3,678	5,050	273	51	4,298	3,009	2,241
Charter	36,610	11,681	5,752	7,471	486	98	2,718	4,336	4,068
Gutu	16,685	5,058	3,132	2,869	209	34	1,123	2,928	1,332
Ndanga	8,774	2,634	1,195	1,502	63	10	1,507	1,182	681
Chibi	95,315	32,758	12,373	20,116	952	18	1,869	19,881	7,348
Bikita	19,691	6,130	2,559	3,047	321	29	728	3,872	3,005
Melsetter	26,168	9,293	3,530	5,113	247	94	1,287	4,761	1,843
Umtali	25,673	9,912	3,585	4,161	286	32	3,035	2,971	1,691
Makoni	29,848	9,947	4,563	5,248	298	69	4,074	3,047	2,602
Inyanga	4,008	1,295	457	677	49	8	422	746	354
Mrewa	4,652	1,523	627	666	31	8	1,072	435	290
Mtoko	869	368	185	142	9	8	65	...	92
Darwin	2,000	613	139	302	24	1	622	253	46
Totals	969,216	313,671	133,373	175,206	9,469	2,508	124,601	126,512	83,876
Estimated total represented by outstanding returns	22,000								
Total	991,216								

TABLE No. 3.

District.	Horses.	Mules.	Donkeys.	Sheep. Merino.	Sheep. All other.	Goats.	Pigs.	Poultry.
Wankie	12	24	238	...	331	144	46	1,532
Nyamandhlovu ...	45	25	324	...	680	318	227	2,456
Bulalima-Mangwe ...	178	56	779	486	4,684	940	1,596	8,606
Matobo	70	64	699	184	2,909	708	315	3,497
Umzingwane	23	28	363	...	2,277	155	229	6,113
Bulawayo	38	26	821	55	1,701	170	415	6,335
Bubi	72	45	648	647	2,767	302	896	4,613
Sebungwe	2	...	12	...	160	...	40	...
Gwelo	164	84	667	1,890	5,923	1,122	1,847	17,717
Selukwe	37	21	34	18	797	219	306	2,214
Insiza	161	126	488	142	4,901	662	608	5,354
Gwanda .. .	60	61	386	10	1,006	270	383	1,247
Belingwe	49	42	154	...	729	776	204	1,047
Victoria .. .	113	27	413	..	2.475	506	605	5,024
Chilimanzi	63	21	192	176	1,396	351	380	3,009
Hartley	136	41	502	100	3,535	723	1,392	11,697
Lomagundi	54	52	161	138	3,741	764	1,375	7,947
Mazoe	176	188	146	255	3,418	199	2,160	7.732
Salisbury	155	117	586	303	2,935	484	2,215	19,716
Marandellas	76	40	115	105	1,353	242	727	4.313
Charter	201	125	915	508	1,866	1,219	908	5,534
Gutu	27	4	66	56	759	194	281	1,282
Ndanga	44	23	118	...	233	224	127	952
Chibi	56	55	5	...	66	218	9	507
Bikita	10	8	59	...	194	23	44	365
Melsetter	168	45	790	1,239	3,275	1,531	496	3,968
Umtali	101	139	271	135	847	594	452	8,405
Makoni	67	40	136	298	930	331	1,120	6,749
Inyanga	20	12	61	47	681	108	63	880
Mrewa	11	5	16	...	170	94	230	1,641
Mtoko	1	...	8	...	...	...	...	...
Darwin	5	...	51	...	244	136	41	291
Totals	2,395	1,544	10,224	6,792	56,983	13,727	19,737	150,743
Estimated totals represented by outstanding returns	95	46	305	805	1,656	886	648	6,545
Totals	2,490	1,590	10,529	7,597	58,639	14,613	20,385	157,288

TABLE No. 4.

District.	Eggs sold. doz.	Cream. Sold as Butter Fat. lbs.	Cream. Sold as Cream. lbs.	Milk sold. galls.	Butter sold. lbs.	Cheese sold. lbs.	Bacon sold lbs.	Wool sold. lbs.	Dipping Tanks.
Wankie	4,954	1,489	1,079	20,681	6,652	15	657	...	18
Nyamandhlovu ...	6,178	15,261	10,875	5,663	6,260	...	390	...	35
Bulalima-Mangwe ...	26,371	103,827	127,743	49,612	5,558	50	1,810	270	93
Matobo	8,168	17,104	18,181	107,732	17,112	460	...	600	49
Umzingwane ...	26,379	19,945	27,640	15,585	26,005	...	1,620	...	21
Bulawayo	26,180	8,336	32,304	103,384	17,260	450	200	600	43
Bubi	10,587	42,473	31,552	35,903	17,260	...	1,844	...	75
Sebungwe	...	...	...	...	...	...	...	...	...
Gwelo	52,556	142,385	93,075	70,839	29,232	1,887	7,287	7,983	147
Selukwe	3,152	5,747	7,999	8,871	3,700	...	3,032	...	36
Insiza	10,587	31,638	59,843	37,725	14,580	70	1,266	784	88
Gwanda	1,111	18,877	14,120	18,268	1,799	...	90	...	42
Belingwe	1,605	320	70	7,481	3,940	...	417	...	23
Victoria	6,890	28,791	6,952	37,559	7,208	...	5,443	...	69
Chilimanzi	13,645	17,985	3,380	7,676	5,372	6,000	1,880	700	52
Hartley	21,393	24,349	29,143	94,932	33,104	57,847	3,160	..	147
Lomagundi ...	16,809	49,194	23,076	46,271	26,075	25,528	7,093	...	104
Mazoe	15,471	8,913	18,026	28,912	14,808	...	1,640	250	157
Salisbury	48,425	32,370	20 119	274,222	79,951	35,664	6,244	1,241	118
Marandellas ...	6,637	10,079	6,912	20,932	13,587	36	1,180	200	67
Charter	7,070	6,013	15,779	38,127	19,092	5,560	641	700	79
Gutu	1,331	7,957	6,240	2,832	1,318	...	286	...	30
Ndanga	360	640	...	2,260	938	...	250	...	12
Chibi	376	...	120	4,550	700	40	420	...	41
Bikita	575	...	...	...	200	...	1,900	...	9
Melsetter	3,867	2,859	1,985	27,152	11,379	6,866	1,095	5,822	66
Umtali	24,551	1,419	8,484	97,545	47,707	1,026	1,990	950	63
Makoni	19,291	10,055	16,203	19,261	20,318	11,541	1,330	1,085	77
Inyanga	1,195	...	1,590	3,885	1,114	...	...	1,492	16
Mrewa	2,411	1,042	250	2,750	2,954	...	...	...	13
Mtoko	...	...	...	...	...	...	...	...	...
Darwin	100	...	...	1,560	260	...	147	...	3
Totals ...	368,225	609,068	582,740	1,192,170	435.443	153,040	53312	22,677	1,794
Estimated total represented by outstanding returns ...	7,000	9,000	12,000	40,000	3,000	...	...	3,000	...
Totals ...	375,225	618,068	594,740	1,232,170	438,443	153,040	53,312	25,677	1,794

Bacon.—The total bacon and ham manufactured by the factories was 565,606 lbs., and in addition 53,312 lbs. was cured on farms, making the gross total 618,918 lbs. The imports amounted to 185,067 lbs., an increase of 78,702 lbs.; and the exports were 121,625 lbs., an increase of 15,043 lbs. From these figures it will be seen that locally cured bacon and ham supply very nearly the whole of the local market for this product.

Wool.—The total wool produced was 25,677 lbs., an increase of 10,252 lbs., or 66 per cent.

General.—There are, according to returns received, 3,825 European males employed in farming and 1,346 European females. The number of native males employed is 72,750, and native females 937. There are, however, roughly 150 returns outstanding which would possibly account for a further 175 European males and probably a further 2,000 native males, bringing the total in round figures to 4,000 European males and 75,000 male natives.

Included in these totals, however, are a certain number of suburban plots, principally near Salisbury and Bulawayo, whose owners are really employed in town and only carry on their small farming operations as a side line to their real occupation. It is interesting to compare these figures with those obtained during the census taken in May, 1926, when 3,681 European males and 277 European females were shown as engaged in farming, and 72,118 male natives and 588 female natives.

It is evident from the above, after allowing for those persons who do not depend entirely on farming for their livelihood, that in the seven months between the taking of the census and the date when these returns were rendered there was a considerable increase in the farming population of the country. The difference in the figures for European females is explained by the fact that in the agricultural returns most farmers showed their wives, and in some cases children, as employed on the farm. In many cases, though probably not all, this is correct, for where dairying and poultry-keeping, etc., are engaged in, the farmer's wife often takes an important part in the work of the farm, apart from her household duties. In the census figures, wives have

probably been shown as engaged in household duties only. An analysis of the European males engaged in farming shows that 2,251 or 58.9 per cent. are either owners or tenant occupiers of farms, 663 or 17.3 per cent. are employed in the capacity of managers, 337 or 8.8 per cent. are classed as learners and 574 or 15 per cent. are paid employees.

Of the 72,750 male natives, 13,982 are employed with cattle and 58,768 on agriculture and general work. It should here be stated that the above totals do not include pupils at mission stations who are employed for part of their time on the land.

During the year prosecutions were instituted for the first time against certain farmers for failure to render the necessary returns, as required by the Statistical Ordinance, and convictions were obtained in all cases with one exception, where evidence proved that the return was completed and sent to the post. As 150 returns were outstanding when the schedules were closed, as against 200 outstanding for the crop returns for the season 1925-26, this action would appear to have had some effect, especially as a greater proportion of returns are outstanding in those districts in which no action was taken. A very large proportion of farmers are still very late in forwarding returns, which is responsible for the delay in the publication of statistics, and consequently information which should be in the hands of the Government and public by March is not available until May.

African Coast Fever.

By Ll. E. W. Bevan, M.R.C.V.S.,
Director of Veterinary Research.

"Let each one so act that those who come after him may say, 'he left our inheritance richer than he found it.'"

AN OLD ENEMY.

It is twenty-six years since African Coast Fever was introduced into Southern Rhodesia, and during this period the losses due to it have been incalculable, not only through the death of cattle, but by reason of the interference with business inevitably associated with it.

EASY TO CONTROL.

Not that African Coast Fever is a difficult disease to control. Within a very short time of its appearance, scientists such as Koch, Theiler, Lounsbury and Watkins-Pitchford had discovered the cause of the disease, the manner in which it is transmitted and, withal, a method of preventing and eliminating it, based upon the destruction of the brown tick by a scientific system of dipping. Time and again this method has proved successful in the hands of the Veterinary Department, whose records show beyond dispute how, when once the disease has been detected and systematic dipping conscientiously applied, the mortality is quickly reduced and the disease rapidly eliminated.

THE METHOD OF INFECTION.

Indeed, when the very delicate process by means of which this disease is perpetuated is considered, it is truly remarkable that it should have persisted so long. In the first place, it is caused by a minute animal parasite, Theileria

parva, which develops partly in the tick and partly in the ox. When introduced by the tick into the body of a susceptible bovine animal (as far as we know, no other species is susceptible), it establishes itself in certain organs, such as the lymphatic glands and spleen, where it multiplies by non-sexual division. Finally, during the last stages of the disease, and then only, it makes its way into the peripheral blood to be taken up by the tick. The period during which the parasite is present in the blood and available to the tick is a matter of a few days only. But if such blood be introduced artificially by means of a syringe into another animal it does not give rise to the disease. The parasite must be taken up by the tick, and a certain variety of tick, in which it can undergo sexual development and so regain its power of causing disease.

FACTS ABOUT THE TICK.

The so-called brown tick (Rhipicephalus appendiculatus) is the chief transmitter of African Coast Fever; the red-legged tick (Rhipicephalus evertsi) and one or two other species of Rhipicephalus occasionally do so.

It may be well to explain here that there are four stages in the life cycle of a tick: first the egg, from which emerges the larva or seed tick; next the nymph, and finally the adult, which gives rise to some three to five thousand eggs. Some ticks—as, for example, the blue tick—remain on one animal throughout the whole period of growth. These are called "continuous" feeders. Others, of which the brown tick is an example, spend each stage on a separate host. They are known as "interrupted" feeders. This at first sight would appear to be of purely theoretical or scientific interest. As a matter of fact, it is of the greatest practical importance, as will be seen later.

AFRICAN COAST FEVER CEASES WITH THE DEATH OF THE TICK.

Now in the case of red-water of cattle, due to a very similar organism, the parasite is taken up by the mother tick in feeding upon an infected animal, and passes through each of the many thousands of the eggs which she deposits to the larvæ which hatch from them, and each of these minute creatures can transmit the disease when it attaches

to a susceptible animal to feed. This is not the case in African Coast Fever, the parasite of which does not pass through the egg to the larva. With the death of the mother tick the infection ceases. But the only manner in which this disease can be transmitted is by the nymph which develops from the larva which has picked up the parasite from an infected animal in the last stages of the disease, or the adult which develops from the nymph which has become infected in a like manner.

ON AND OFF IN FOUR DAYS.

Another scientific fact is of practical importance. The larval brown tick does not remain long upon the animal upon which it feeds; it is generally on and off in as short a period as three days. Similarly, the nymph may be on and off in three or four days, and the adult may complete its feed in four to eight days.

It is upon all this detailed knowledge that the practical method of dealing with African Coast Fever is based.

SHORT-INTERVAL DIPPING.

First of all, if there were no brown or red-legged ticks there would be no African Coast Fever. But to get rid of them is not so easy as would appear, for the reason above stated—that they are on and off the animal in as short a period as three days. Obviously, the ordinary fortnightly or even weekly dipping will not catch them. They will be on and off before the dipping day comes round. To do so, therefore, short-interval dipping will have to be resorted to—that is to say, the immersion of the cattle at intervals of three to five days in an appropriate solution of arsenic of sufficient strength to kill the tick without harming the ox.

WEEKLY DIPPING HELPS.

Although, as a means of rapidly eradicating the brown tick, weekly dipping is inadequate, it is still of considerable value, in that if conscientiously practised for a long period it will, in the long last, reduce the number of ticks to a minimum; so that if African Coast Fever be introduced it will not spread very rapidly and, once detected, will be easily controlled. Moreover, if at those periods of the year when ticks are most numerous short-interval dipping is

applied to reduce their numbers, weekly dipping, if substituted later, will suffice to maintain the number of survivors at a minimum.

HOW THE STOCK OWNER SHOULD ASSIST.

But for some time to come African Coast Fever must continue to exist, and the brown tick must continue to flourish in those parts of the country where measures of control have not yet been established. It behoves every stock owner, therefore, to be on his guard. If he at once takes steps to eradicate the tick by short-interval dipping, and is careful to detect the first case of African Coast Fever among his cattle, the disease cannot make great headway, even should it be introduced into his herds. To this end he should report to the veterinary authorities every sick or dead animal, and should learn to prepare blood smears and other specimens for microscopic examination and diagnosis. For this purpose glasses, addressed wrappers and bulletins describing the method of preparing specimens are supplied by the Government free of charge.

CO-OPERATION NECESSARY.

From what has been written it may be realised that African Coast Fever is a disease which can be easily overcome if all sections of the pastoral community will make up their minds to overcome it. The Government and the Veterinary Department have accepted the challenge laid down at the recent special congress of the Agricultural Union to set themselves the task of eradicating African Coast Fever from this territory before the 1st January, 1929, but their best intentioned efforts must fail without the whole-hearted collaboration of every stock owner in the country. The strength of the chain is in the weakest link, and in forging a chain to control this disease, which all too long has handicapped and retarded the progress of this country, we must see to it that there be no weak link in it.

A NATIONAL DUTY.

Already the cattle trade is improving and markets are awaiting our stock if we could but give them a "clean bill of health." Therefore the stock owner, rich or poor, black or white, who does not play his part in the war which has been declared upon African Coast Fever is not only false to his country, but blind to his own interests.

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, 1925-26.

(*Continued.*)

By H. C. Arnold, Manager.

Experiments with Crops for Silage.—Though numerous crops are suitable for use as silage, the most popular of all crops used for this purpose is probably maize, and undoubtedly this plant holds the premier position among Rhodesian silage crops. Sometimes a leguminous crop is mixed with the maize to improve the nutritive value of the silage, but, of a number of crops experimented with at this station, maize has invariably given the most satisfactory results as the basis of all silage mixtures.

Maize for Silage: Distance-Planting Trials.—The object of these trials is to determine the most suitable distance apart in the row for planting maize which is to be ensiled. The two extreme plantings of 40 inches x 6 inches and 40 inches x 24 inches were discontinued last year, because previous trials showed that very close plantings consistently gave rather smaller returns of inferior fodder, and, though plantings at 40 inches x 24 inches apart resulted in fairly heavy yields of fodder, the stalks were much thicker than is desirable.

Yields of Green Fodder in Tons per Acre.

Distance of planting.	Average yield of duplicate plots, 1925-26.	Average yield, 1921-25.	Average yield over five years.
40 inches x 9 inches	6.0	9.4	8.7
40 inches x 12 inches	6.0	10.2	9.3
40 inches x 15 inches . .	5.9	10.0	9.2
40 inches x 18 inches . ..	5.8	9.5	8.8

Trials with maize and velvet beans sown in combination for silage have been discontinued after a period of five years, during which period they were grown together under various conditions of soil fertility and rainfall. The experiments revealed that heavier yields were obtained when the maize was sown two weeks earlier than the velvet beans. When the beans were sown first, and an interval of two weeks passed before the maize was sown, the growth of the latter was severely checked by the beans and lighter yields resulted.

Farmers who cultivate maize almost exclusively sometimes prefer to grow a different kind of crop for silage, and for that reason sunflowers are often chosen. When used alone, they often give a silage which is rather too sour to be relished by cattle, particularly if they are ensiled before they are sufficiently mature. On the other hand, if the crop is left too long, the lower parts of the stalk are liable to become very fibrous and unpalatable. The best results are obtained from plants on which the flower heads are fairly well developed, and the petals or rays are beginning to wilt.

Trials with sunflowers grown in conjunction with velvet beans have been conducted here for the past four seasons, the methods of planting being as follows: (1) Sunflowers and velvet beans sown in the same row on the same day at 36 inches x 9 inches apart. (2) As for No. 1, but the beans are sown fourteen days later than the sunflowers. (3) The two crops are sown in alternate rows 20 inches x 12 inches apart, both on the same day.

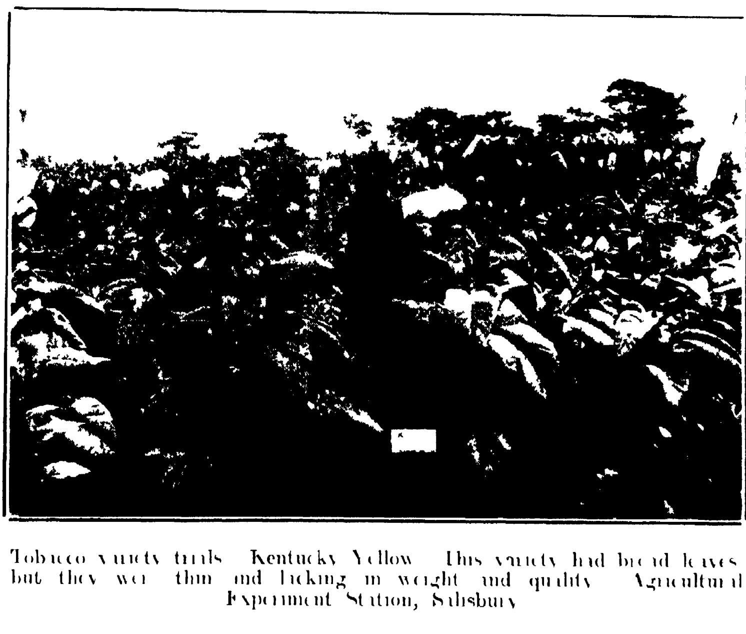
Tobacco variety trials. Little Orinoco. This variety has rather narrow leaves but they were heavy and when cured gave a high-class product. Agricultural Experiment Station, Salisbury.

New introductions of heavy leaf tobacco types suitable for "fire" curing at Agricultural Experiment Station, Salisbury, 1925-26.

Sudan grass. A heavy cropper of fodder suitable for hay or silage.
Agricultural Experiment Station, Salisbury.

Sesbania cinerescens. A native shrub suitable for tobacco sticks.
Agricultural Experiment Station, Salisbury.

Ground nut distance planting trials. Agricultural Experiment Station, Salisbury. 36 inches x 8 inches in foreground, 24 inches x 8 inches background.



Tobacco variety trials. Kentucky Yellow. This variety had broad leaves but they were thin and lacking in weight and quality. Agricultural Experiment Station, Salisbury.

Yields in Tons of Green Fodder per Acre.

Method of planting.	Average of three seasons.	1925-26.	Average of four years.
No. 1	10.2	13.6	11.0
No. 2 ...	9.3	15.0	10.7
No. 3 . .	10.2	13.8	11.1

When the operation of harvesting sunflower seed occurs at the same time as silage-making at this station, the de-seeded sunflower heads as well as the upper part of the stalks are mixed with the other fodder. In this way the sunflower crop is utilised to its fullest extent, and our supply of silage is augmented with the most palatable part of the sunflower plant. If the heads are dry, the precaution is taken to sprinkle them with a little water before they are put in the silo, unless the other material contains sufficient moisture to counteract the sunflower's lack in that respect.

Other Silage Mixtures.—Niger seed (*Guizotia oleifera*), Sudan grass and Kokoma grass have all proved themselves to be very suitable for silage, either alone or mixed with legumes. They have an advantage over maize and sunflower in that, by reason of their thin stems, they can be packed in the silo without previous chopping into short lengths, and while still whole they can be fed to cattle after the manner of hay and without waste.

Like the sunflowers, Niger seed prefers good soil and a liberal rainfall, and when these are combined yields as high as sixteen to twenty tons of green fodder per acre are obtained, from which silage of good quality may be made. The crop should be ensiled when its flowering period is nearly completed, at which stage the seed of the earliest flowers will be fully developed, and the stalks will not have become too fibrous. When the crop is a luxuriant one, sweeter silage will be obtained if it is wilted for a day or so before it is ensiled, and if it is properly handled the product will be superior to sunflower silage.

Sudan grass should be cut for silage as soon as the field is well covered with flower heads, or even earlier than that if

leaf strip is present and its development is being favoured by frequent showers of rain.

Kokoma grass also makes the best silage when it is cut at the early flowering stage. This grass is believed to be one of the heaviest yielders of our native grasses, rivalling even Napier grass for the premier position. It is an annual, but it seeds freely and at the station its volunteer crops have given heavy yields from the same land for five successive seasons without cultivation of any kind beyond a light stirring of the surface soil during the early part of the season in order to cover the seed. In those parts of the Colony where this grass occurs in its wild state, it is sometimes found to be a troublesome weed in cultivated lands. On this station, the seed is carried to lower levels by storm water, but the seedling plants do not thrive when they grow in competition with established perennial grasses. Only on vacant spots where the storm water has deposited a layer of silt are the seedlings able to thrive for a few seasons, but even in such places they are overcrowded by perennial grasses after a short time. That the grass would become a serious nuisance seems unlikely, therefore, if reasonable precautions are taken to prevent it from spreading into cultivated land.

Yields of Green Fodder in Tons per Acre.

Kind of crop.	Average of three years.	1925-26.	Average of four years.
Niger seed alone	13.6	12.0	13.2
Niger and velvet beans .	12.4	12.5	12.4
Sudan grass	7.3	7.4	7.3
Sudan and velvet beans	6.2	3.8	5.5
Sudan and niger oil	12.6	11.3	12.3

Weights of Miscellaneous Fodders ensiled.

Kind of crop.	Average of two years.	1925-26.	Average of three years.
Napier grass	12.6	10.6	11.9
Napier and kudzu	7.4	9.6	8.1
Umfufu	12.6	7.4	10.9
Cow cane	4.1	8.5	5.6
Guinea grass	8.8	6.8	8.1
Kokoma grass...	16.4	9.8	14.2
Phaseolus helvolus	...	13.5	...
Dolichos bean	...	10.8	...

Liming Trials.—The periodical application of lime to cultivated land and pastures is an established practice in many parts of the older countries, and the fact that most of the Rhodesian soils are slightly acidic suggests the addition of lime to increase their cropping power. Several trials with lime have been conducted at this experiment station, as well as on several private farms in different parts of Rhodesia, but the results obtained so far are too inconclusive to permit of a definite decision either in favour of liming the land or against it.

A new series of trials with agricultural lime were started this season with a view to gaining more information on this subject, but the results for this, the first year, are as conflicting as those of previous trials. The reason for this may be partly due to the late application of the lime, which was delayed until October; and, because it is a slow-acting agent, its effect cannot be expected to become fully apparent during the first season. This probably accounts for the conflicting results shown in the following table:—

Liming Experiments with Maize: Yield in Lbs. per Acre.

Treatment.	Series No. 1.	Series No. 2.
No lime	4,410	3,840
Half ton lime per acre	5,340	4,530
One ton lime per acre..	4,200	4,320

Thus, in the first series, the plot to which one ton of lime was applied gave a lower yield than the plot which was not treated. In the second series those results were reversed, while in both series the plot which was given a dressing of half a ton of lime per acre gave a heavier yield than either of the others. It is apparent, therefore, that the lime had little or no effect, and that the differences in yield are mainly due to other causes. These results are valuable, however, in that they indicate the relative natural fertility of these plots, so that variations from these yields for the individual plots in next season's crop will reveal the effect of the applications of lime.

Cotton, sunflower, ground nuts and haricot beans were included in these trials, but the results obtained with them were as unsatisfactory as they were with the maize. These trials are being continued and the results will be reported at the end of each season.

Ground Nut Trials.—During the past few years this crop has rapidly gained in favour among Rhodesian farmers, many of whom regularly include it in their rotation. The distance-planting trials commenced here in 1919-20 have consistently demonstrated that close planting conduces to heavy yields. At the time these trials began, the common practice was to sow in rows 36 to 40 inches apart, and sometimes 12 inches to 18 inches apart in the rows. The trials conducted at this station prove that spacing at 18 inches x 6 inches is not too close in a season with an average rainfall, so the distance between the rows at which a farmer should plant is 18 inches, or as near to that as his method of cultivation will allow. By close planting a large number of farmers have raised their average yield to over 20 bags per acre, and in at least one instance this season as many as 35 bags per

acre were reaped over a large area. Having invariably indicated that heavier yields result from close planting, these trials have now served their purpose and will not be continued after this year.

Yields of Unshelled Ground Nuts in Lbs. per Acre.

Spacing in 1919-24.	Average yield of unshelled nuts per acre	Spacing in 1924-26.	Yields in 1924-25.	Yields in 1925-26.	Average yield over two seasons.
18 x 6 inches	1,560 lbs. (3 years)	18 x 8 inches	1,422	1,674	1,548
24 x 6 ,,	1,162 lbs. (1923-24)	24 x 8 ,,	1,023	1,477	1,250
24 x 10 ,,	1,034 lbs. (3 years)	30 x 8 ,,	956	1,428	1,192
30 x 8 ,,	1,184 lbs. (3 years)	36 x 8 ,,	940	1,212	1,076

Ground Nut Variety Trials.—The object of these trials, which are conducted on duplicate plots each year, is the investigation of the merits of several different kinds of this plant. They were commenced in 1922 with nine strains, and since that time the number of varieties under trial has increased to nineteen. This number includes most of the standard varieties which are grown in Rhodesia, together with strains received from the Union of South Africa, United States of America, Australia, etc., and consists of thirteen strains of the bunch type and six of the runner type. The latter kind, because of their spreading habit, deposit their fruit over a wide area, and are therefore more difficult to harvest than the bunch varieties. Besides this, they are usually coarse shelled, and yield a lower percentage of nuts to husks than the majority of the bunch varieties. For these reasons, though their yield of nuts is often rather heavier, they are probably less profitable to grow for commercial purposes than the other kinds.

So far none of the bunch varieties introduced from other countries has proved markedly superior to the popular variety known as Spanish Bunch. This variety is similar to and possibly identical with the one called Virginia Bunch in the Union of South Africa and that named Valencia, which was

received from the Department of Agriculture of the United States of America.

Yields in Lbs. of Unshelled Nuts per Acre to nearest 10 *Lbs.*

Name of variety.	Average for two seasons (1923-25).	Average of duplicate plots (1925-26).	Average over three seasons.
Runner varieties—			
Jumbo	1,910	2,590	2,135
Virginia Runner	1,620	2,520	1,920
Gambia	1,410	2,480	1,770
Large Japanese	1,280	2,340	1,640
Mammoth	...	2,570	...
Chinese	...	2,250	...
Bunch varieties—			
Virginia (U.S.A.)	1,320	2,510	1,720
African (Union)	1,160	2,630	1,650
Natal (Union)	1,130	2,450	1,570
Virginia Bunch (Victoria)	1,210	2,270	1,560
Spanish Bunch (A. E. S.)	1,120	2,160	1,470
Virginia Bunch (Union)	1,120	2,050	1,430
Tennessee Red (Union)	980	2,300	1,420
Java White	1,050	2,160	1,420
Valencia	1,060	2,120	1,415
Tennessee Red (A. E. S.)	920	2,160	1,340
Spanish Bunch (Union)	920	2,160	1,340
Improved Spanish (U.S.A) ...	900	2,190	1,330
Spanish (U.S.A.)	850	2,050	1,250

Tobacco.—Three new varieties which have thick or heavy leaves, and are therefore suitable only for fire curing, were included in the trials this season. In one series they were

grown on land which had been in cultivation for fourteen years, and had carried maize for the five previous seasons. In the other series the tobacco followed a crop of velvet beans which had been grown for seed, on land which had been in cultivation for three years only. In both series the tobacco was planted on 22nd January, 1926. The following table shows the manurial treatment in each case and the yields of cured leaf obtained.

Yields of Cured Leaf in Lbs. per Acre.

Variety.	Land cropped 14 years. Manured 8 tons kraal manure and 300 lbs. double complete tobacco fertiliser.	Land cropped three years. Manured 300 lbs. double complete tobacco fertiliser.	Average yield of cured leaf from two plots.
One Sucker	1,018	981	999
Little Orinoco	828	915	871
Kentucky Yellow ...	895	696	790

The Kentucky Yellow was ready for curing on 26th April, but the other varieties were ten days longer in ripening. Though the leaves of the Kentucky Yellow were broader than those of the other kinds, they lacked thickness and therefore weight. One Sucker gave the heaviest yield of cured leaf, but the leaves were rather narrow, with a heavy midrib, which reduced the value of the product to some extent. It is thought, however, that this variety may improve as it becomes acclimatised, and its cultivation is being continued.

Of these three varieties the one named Little Orinoco gave the most satisfactory results when quality as well as yield is considered.

Sesbania Cinarescens.—This native leguminous shrub is widely distributed over the Colony. In its natural habitat it is usually found growing in damp soils. It is a very hardy, quick-growing plant, possessing fairly straight stems, the lower five or six feet of which are practically branchless. For these reasons it has been suggested that it could be used

for tobacco sticks by farmers who experience difficulty in procuring suitable sticks for this purpose. When grown in cultivated land, this plant does not require a moist soil and is found to thrive on any soil of average fertility and to possess excellent drought-resistant qualities.

A small trial plot was sown at this station in November, 1925, and the seed germinated well, though somewhat unevenly. After the initial seedling stages were passed, the growth of the plants was remarkably fast, and at the end of April, 1926, they were over ten feet high. They continued growing until the cold and dry weather checked them in June, at which time they were twelve to fifteen feet high and their stems averaged one-and-a-quarter inches thick at six inches above the ground-level and one inch thick at six feet above the ground. A few were cut, and they were found to be strong enough to carry a load of green tobacco leaves, so there is no apparent reason why they should not be suitable for the purpose mentioned. So far, however, it has not been possible thoroughly to test the sticks in a tobacco barn, and until this is done their value as tobacco sticks cannot definitely be determined.

There are several species of Sesbania among the shrubs of Rhodesia, and farmers who wish to give this plant a trial must be careful to get the right one. This can be distinguished by its flowers, which are borne in hanging clusters after the manner of the laburnum and wistaria; the wings and inner side of the standard petals of the flower are bright yellow, but the keel and outer side of the standards have a light yellow ground which is thickly covered with purple spots. The seed pods are smooth, elliptical in section, about a quarter of an inch in diameter and nine to twelve inches long. This species must not be confused with the pretty blue-flowered Sesbania, whose stems and leaves resemble it very much. This latter species frequently occurs on Rhodesian farms, but its stems are not strong enough for tobacco sticks.

(To be continued.)

The Feeding of Dairy Stock in Southern Rhodesia.

(Continued.)

By T. HAMILTON, M.A., N.D.A., N.D.D., and
J. R. CORRY, B.Sc. (Agr.), Dairy Experts.

Simplified Feeding.—It has been clearly shown that the type of ration commonly fed to dairy cows in Rhodesia is unsuitable and in many respects inadequate for milk production. In too many cases no attempt is made to provide suitable and balanced rations for the dairy herd, with the result that it is the rule rather than the exception to find that the average Rhodesian dairy cow is over-milked and under-fed for at least five or six months of the year. As far as dairy stock are concerned, it is undoubtedly time that better feeding practices were more generally adopted.

Many enquiries in connection with feeding have been received from farmers who have recently purchased dairy stock under the Government loan scheme, and there appears to be a demand for a simple, practical method of compounding rations for dairy cows.

Rationing systems, however, involving complex calculations would in most cases be regarded as impracticable under Rhodesian conditions. The farmer is advised, therefore, to compound rations for his dairy stock in accordance with the following rules:—

1. Feed all the roughage the animals will clean up at all times. As is stated elsewhere, a cow will consume approximately 2 lbs. of dry roughage or 3 lbs. of silage and 1 lb. of dry roughage for every 100 lbs. live weight.

2. Feed concentrates according to production at the rate of 2 to 3 lbs. for each gallon of milk produced daily, or, alternatively, feed 1 lb. of concentrates daily for every lb. of butter fat produced per week. A cow producing 7 lbs. of

butter fat in seven days should receive 7 lbs. of concentrates daily in addition to a liberal allowance of good roughage. The above rule applies only when roughage of good quality is used.

3. Feed a mixture of concentrates suitable for supplementing the roughage, i.e., adjust the concentrate mixture to suit the available roughage. If the roughage consists chiefly of veld hay, silage and similar feeds, the concentrate mixture should contain about 20 per cent. digestible crude protein.

A combination of roughages, such as maize silage and legume hay, may, on the other hand, be supplemented by a concentrate mixture containing about 14 per cent. digestible protein.

Protein Content of Concentrate Mixtures.—The percentage of digestible crude protein in a mixture of concentrates may be calculated in the following manner:—

A concentrate mixture consists of—

2 parts maize meal.
1 part wheat bran.
1 part ground nut cake.

On referring to the "Analysis of Feeds" it will be seen that maize meal contains 7.3 per cent. digestible protein; wheat bran contains 15 per cent. and ground nut cake 46.8 per cent. digestible protein.

The protein content of each feed, multiplied by the number of parts of that feed, is added together and the result divided by the total number of parts of the feeds used in the mixture, e.g.:—

	Protein content.
2 parts maize meal (2 x 7.3)	14.6
1 part wheat bran (1 x 15.0)	15.0
1 part ground nut cake (1 x 46.8)	46.8
4 parts.	76.4

$\frac{76.4}{4}$ equals 19.1 per cent. digestible crude protein.

The above mixture therefore contains 19.1 per cent. digestible protein.

Concentrate Mixtures and Typical Rations.—As a rule the Rhodesian dairy farmer has but a limited selection of foodstuffs available for winter feeding; as far as the roughage is concerned, maize silage, veld hay and, to a lesser extent, leguminous crops, are the chief feeds.

In the following, concentrate mixtures suitable for supplementing these and similar roughages are submitted. No claim is made that these mixtures are ideal. The rations given and the concentrate mixtures suggested are compounded largely from feeds usually grown on the farm, and they are recommended as suitable chiefly for cows of average production.

The first series of mixtures presented are suitable for supplementing a mixture of low protein roughages such as maize silage and veld hay or maize silage and maize stover, etc.

It will be noted that where the roughage consists chiefly of the above and similar feeds, a liberal allowance of concentrates is recommended, and the farmer is advised to feed the concentrate mixtures in the first series at the rate ot at least 3 lbs. for each gallon of milk produced daily.

The second series of concentrate mixtures are suitable for supplementing a mixture of low and high protein roughages such as maize silage and legume hay, etc.

When fed with roughage of this nature, the allowance of concentrates need not be excessive, and the mixtures suggested should be fed at the rate stated.

1. *Concentrate Mixtures suitable for supplementing roughage of low protein content,* e.g., *veld hay, maize silage, maize stover, red top hay, etc.*—To be fed at the rate of 3 to 4 lbs. for each gallon of milk:—

(1) 3 parts maize meal.
2 parts ground dolichos beans (seed and pod).
2 parts ground nut cake.

(2) 2 parts maize meal.
1 part wheat bran.
1 part ground nut cake.

(3) 2 parts maize and cob meal.
2 parts ground oats.
2 parts ground nut cake.

(4) 2 parts maize and cob meal.
1 part ground dolichos beans.
1 part ground nut cake.

(5) 3 parts maize and cob meal.
2 parts ground sunflower seeds (with hulls).
2 parts ground nut cake.

Typical Rations.—For average cows producing 2 gallons of milk daily:—

(1) 35 lbs. maize silage.
10 lbs. red top hay.
2 lbs. maize and cob meal.
2 lbs. ground oats.
2 lbs. ground nut cake.

(2) 20 lbs. maize silage.
10 lbs. sweet potatoes.
10 lbs. veld hay.
3 lbs. maize meal.
2 lbs. ground dolichos beans (seed and pod).
2 lbs. ground nut cake.

2. *Concentrate Mixtures suitable for supplementing a mixture of low and high protein roughages, e.g., maize silage and legume hay, etc.*—To be fed at the rate of 2 to 3 lbs. for each gallon of milk:—

(1) 3 parts maize and cob meal.
2 parts ground dolichos beans.
1 part ground nut cake.

(2) 1 part maize meal.
1 part ground dolichos beans.
1 part ground nuts (with hulls).

(3) 3 parts maize and cob meal.
1 part ground nut cake.

(4) 2 parts maize and cob meal.
2 parts ground dolichos beans.
1 part cotton seed cake.

(5) 3 parts maize and cob meal.
2 parts cotton seed cake.

(6) 2 parts maize meal.
1 part velvet bean seed meal.
1 part ground nuts (with hulls).

(7) 4 parts maize meal.
2 parts wheat bran.
1 part ground nut cake.

(8) 2 parts maize and cob meal.
2 parts velvet bean seed meal.
1 part ground sunflower seeds and heads.
1 part ground nuts (with hulls).

(9) 2 parts maize meal.
2 parts ground nuts (with hulls).
1 part ground sunflower seeds and heads.

Typical Rations.—For average cows producing 3 gallons of milk daily:—

(1) 35 lbs. maize silage.
12 lbs. ground nut hay.
4 lbs. maize meal.
2 lbs. wheat bran.
1 lb. ground nut cake.

(2) 20 lbs. maize silage.
10 lbs. sweet potatoes.
12 lbs. dolichos bean hay.
7 lbs. mixture—
1 maize meal.
1 ground dolichos beans.
1 ground nuts (with hulls).

(3) 35 lbs. maize silage.
6 lbs. cowpea hay.
6 lbs. maize stover.
7 lbs. mixture—
3 parts maize and cob meal.
2 parts ground dolichos beans.
1 part ground nut cake.

Spring and Summer Feeding.—During spring and early summer, when there is usually an abundance of green and succulent grazing, the feeding of dairy stock is very much simplified. Veld grass in a green and succulent condition furnishes a fairly well-balanced ration and is practically all that is required for animals of less than average production. The necessity for feeding concentrates, however, to dairy cows on pasture has already been emphasised in an early chapter of this article, where it is shown that it is impossible

for heavy milking cows to satisfy their requirements for milk production from veld grazing alone; extra feed in the form of concentrates is invariably required. An additional reason for feeding concentrates to dairy stock on early spring pastures lies in the fact that the average Rhodesian dairy cow is usually in poor condition at this period of the year. It is the common practice for dairy cows to calve at the end of winter or in early spring, and they frequently do so in poor condition. In order that the animal may regain condition and rapidly attain her maximum yield of milk, it is essential that a certain amount of extra feed be supplied. The farmer should make a practice, therefore, of feeding concentrates to dairy cows on early pasture. As a rule the most critical period of the year for the dairy cow is late summer or early autumn. At this time the grazing is usually inadequate or otherwise unsatisfactory for maintaining a full flow of milk.

The most economical supplement to veld pasture at this time is silage or green maize, and as far as possible the dairy cow should receive a liberal allowance of these or similar feeds. The amount of grain to feed to cows on pasture may vary considerably, but as a general rule 2 lbs. of concentrates for every gallon of milk is a liberal allowance. If a limited amount of concentrates is fed, maize meal is as satisfactory a feed as any other, but when a heavy allowance of grain is required—5 lbs. or more—it is advisable to give a certain amount of feeds rich in protein. The following mixtures of concentrates are suggested as suitable for supplementing veld grazing:—

(1) 1 part maize meal.
    1 part wheat bran.
(2) 2 parts maize and cob meal.
    1 part cotton seed cake.
(3) 4 parts maize meal.
    1 part ground nut cake.

Winter Feeding.—A considerable portion of this article refers directly to the winter feeding of dairy cows, and it is hardly necessary, therefore, to enter into a further discussion on this subject. Successful winter feeding is largely a matter of imitating summer conditions. Every farmer knows that the average dairy cow usually attains her maxi-

mum production of milk while on summer pasture, when she is receiving an abundance of palatable, succulent and well-balanced food. As far as possible, therefore, an attempt should be made to maintain these conditions throughout the year. This is entirely feasible if the subject is properly understood and the necessary provision of various winter feeds made.

Succulent feed in the form of silage and sweet potatoes is usually obtainable; in fact, there are very few farms in Rhodesia on which one of these two feeds could not be grown.

In many cases crops such as wheat, barley, oats, etc., can be grown for winter feed. Where crops of this description can be produced the whole problem of maintaining summer conditions throughout the winter is very much simplified.

Green wheat, oats, barley, etc., whether grazed or cut and fed, furnish excellent feed for dairy stock, and when supplemented with suitable concentrates, provide well-balanced rations. Green crops of this kind should be supplemented by concentrates or a mixture of concentrates similar to those recommended for supplementing veld pastures; in fact, the same concentrate mixtures could safely be used.

If the production of winter crops is impossible, except on a very limited scale, it becomes more difficult to maintain exact summer conditions. Excellent results, however, can be obtained by feeding the succulent feeds previously mentioned, together with hay of good quality and concentrates. The importance of leguminous crops in the winter ration of a dairy cow has been emphasised elsewhere; it is sufficient here to state definitely that for economical winter feeding it is essential that legumes be freely used. In some cases a leguminous crop, together with maize, is made into silage. This is quite good practice, and the mixed silage makes good feed.

When compounding rations reference should always be made to the "Analysis of Feeds" attached to this article. The table of the "Analysis of Feeds" has been reprinted and adapted from the "General Composition and Digestible Nutrients of Farm Foods," as published in the *Rhodesia Agricultural Journal* for February, 1924: "The Feeding of Fattening Cattle, Dairy Cows and Pigs."

ANALYSIS OF FEEDS.

Name of foodstuff.	In 100 lbs.			Nutritive ratio.
	Dry matter.	Digestible crude protein.	Total digestible nutrients.	
CARBONACEOUS CONCENTRATES—	lbs.	lbs.	lbs.	1 :
Maize	91.7	7.3	86.8	10.9
Maize and cob meal	90.0	4.7	75.3	15.0
Kaffir corn	88.8	7.4	80.8	10.0
Oats	92.3	10.7	75.0	6.0
Barley	88.8	6.9	77.6	10.2
Buckwheat	90.0	8.6	64.9	6.5
Nyouti	91.6	6.7	74.7	10.1
Rapoko	89.4	4.5	70.5	14.6
Maize bran	87.5	4.7	71.0	14.1
CONCENTRATES—MEDIUM PROTEIN CONTENT—				
Velvet bean seed and pod	88.7	14.5	75.5	4.2
Cowpea	89.2	20.2	76.7	2.8
Sunflower seed with hull	93.5	15.5	94.6	5.1
Linseed	93.3	21.4	97.0	3.5
Ground nut with hull	94.0	21.3	106.7	4.0
Cotton seed	90.6	14.5	89.2	5.1
Wheat bran	89.0	15.0	60.0	3.0
CONCENTRATES HIGH PROTEIN CONTENT—				
Velvet bean seed	91.2	23.9	83.5	2.5
Ground nut kernels	95.2	27.3	133.1	3.8
Ground nut cake	92.0	46 8	84.7	0.8
Cotton seed cake	93.2	28.3	72.1	1.5
DRY ROUGHAGE—				
Velvet bean hay	90.7	7.3	45.4	5.2
Dolichos bean hay	91.4	7.5	45.3	5.0
Kudzu vine hay	91.9	5.8	45.4	6.8
Ground nut hay	90.5	7.5	52.3	6.0
Cowpea hay	91.8	9.0	52.3	4.8
Veld hay	91.9	1.2	35.9	29.0
Oat hay	91 8	2.6	50.8	18.5
Teff hay	91.0	3.7	47.9	12.0
Manna hay	91.7	3.1	47.3	14.2
Common red-top hay	92.4	2.8	49.3	16.6
Golden Timothy hay	91.4	2.6	39.9	14.3
Sudan grass hay	91.8	4.2	51.1	11.1
Maize stover	91.6	1.7	54.0	30.7
FRESH GREEN ROUGHAGE—				
Green lucerne	24.0	3.2	13.3	3.1
Green oats in flower	23.2	1.4	13.7	8.8
Green barley in flower	31.4	1.5	20.7	12.8
Green Napier fodder	38.2	1.6	19.6	11.2
Green sugar cane	26.3	0.8	15.7	18.6
Green maize	17.2	0.7	9.3	12.3
SILAGE AND SUCCULENTS—				
Maize silage	24.2	1.1	15.0	12.6
Maize and sunflower silage	17.4	1.2	10.6	7.8
Uba cane silage	26.0	0.8	16.1	19.1
Pumpkin	9.0	0.9	7.4	7.2
Sweet potato	29.6	1.0	24.2	23.2
Majorda melon	5.4	0.3	4.4	13.7

Farm Homesteads.

By R. H. Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

In view of the frequent requests made to the Department of Agriculture for drawings and particulars of the various "type" homesteads which have been prepared in this office, it is felt that the publication of the drawings with the desired information regarding the four types in existence will serve a useful purpose.

The present article deals with Departmental Types I. and II. As these are to a large extent similar, in that they both consist of circular brick huts, the same general remarks apply to both.

TYPE I.

Brickwork.—The foundations consist of 14 inch brickwork carried to a minimum depth of 12 inches, but this depth should be increased where necessary to reach compact foundation. The ant-proof course should be laid on the top of the first course of 9 inch work, and may consist of flat galvanised iron sheets 12 inches wide, projecting inside and out; it should be laid with 6 inch laps at joints, where it should be soldered. Above the ant course the brickwork is laid in lime mortar 1 : 4, with joints not more than ⅜ inch thick; on the outside these joints are raked out and pointed with cement mortar. To maintain a truly circular shape, a 1½ inch pipe should be erected at the centre and the circle struck by means of a rotating arm working on the pipe.

Lintels.—The lintels over doors and windows may be of the following types:—

(a) 6 inch x 3 inch deals as shown.

(b) Brick arches 9 inches thick, with a rise of 3 or 4 inches.

(c) Concrete lintels, which should be reinforced with fencing standards when the opening exceeds 3 feet 6 inches.

The three types are all shown in Fig. III.

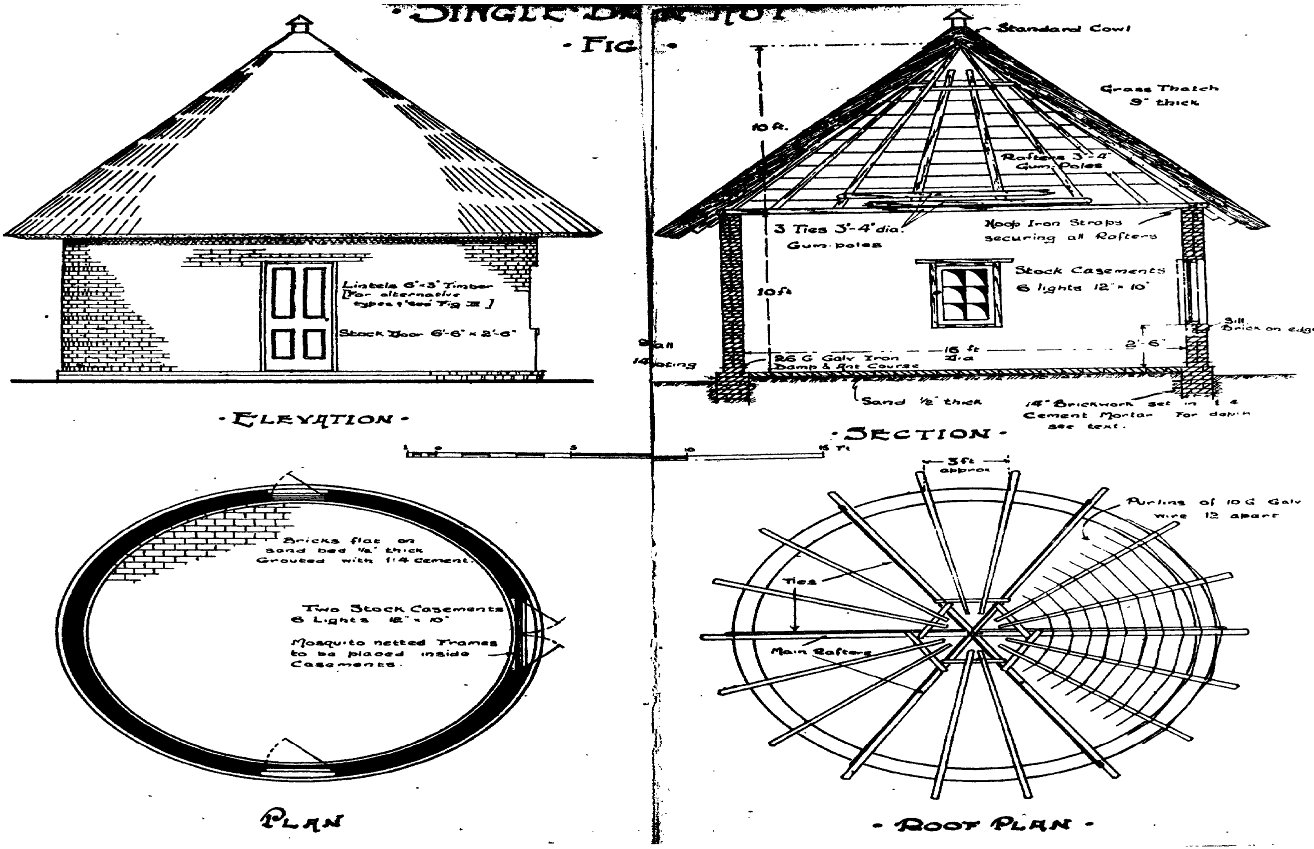
Plaster.—Plastering of the inside walls ½ inch thick with 1 : 3 lime mortar is provided for in the schedule of quantities.

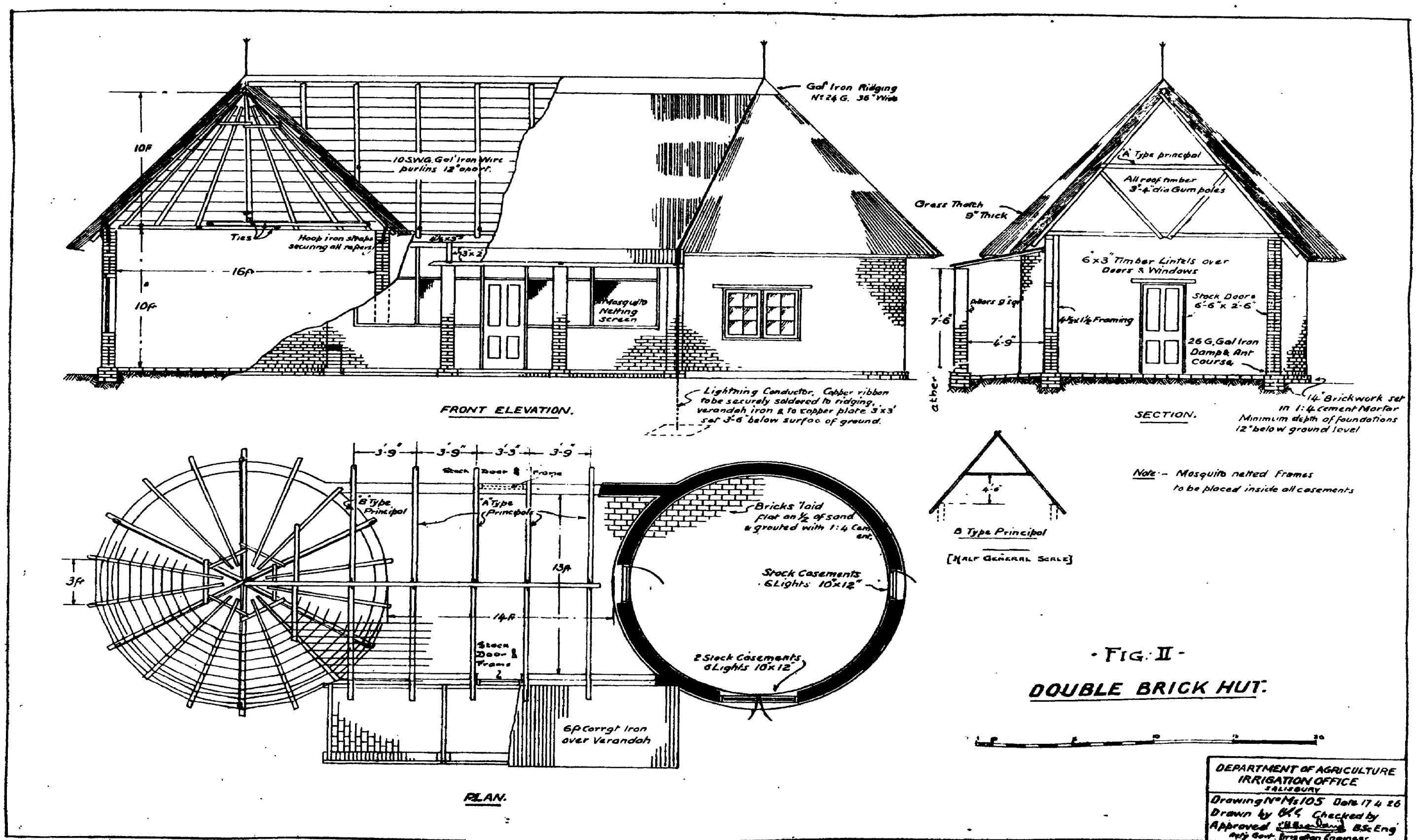
Roof.—The roof timbering is composed of gum poles as straight as possible and 3 inches to 4 inches in diameter; the construction is shown in the two drawings of the roof. At their upper ends the six main rafters are spliced and secured together, and at their lower ends are secured both to the horizontal ties and to the wall. All rafters are secured to the wall by hoop iron carried at least four courses into the brickwork. When the timbering is in position, purlins of No. 10 galvanised wire are secured to it at intervals of 12 inches by means of staples, and over this wire is stretched 1½ inch wire netting, which is of value in promoting even thatching without sag, and also is of assistance in case of fire. The thatching should be combed of all short lengths which might fall through into the room below.

Floor.—The floor consists of bricks laid flat and grouted with 1 : 4 cement mortar. They may be laid on a sand bed after the ground has been properly levelled and cleared of tree roots, etc., or otherwise a layer of rubble may be put down and thoroughly consolidated and levelled, but in either case the floor should be below the ant course and the grouting carefully done to render the floor impervious to ants. The finished surface of the floor may be floated off with a ¾ inch coat of rich cement mortar.

TYPE II.

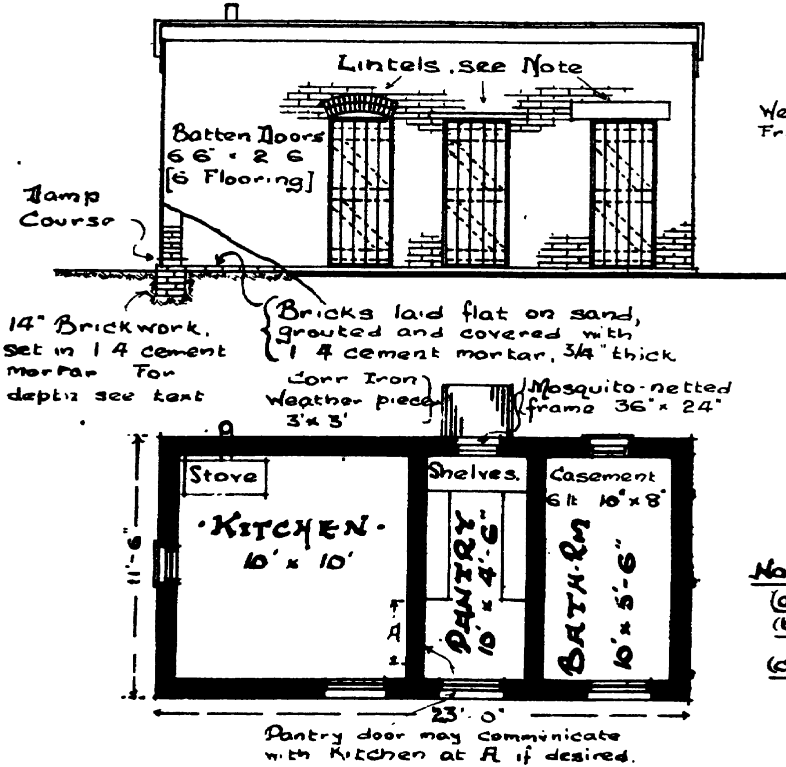
Type II. consists of two such circular huts built 14 feet apart and the space between enclosed to form a third room. The front of this room is open except for a mosquito-netted screen and is protected by a 6 ft. entrance porch or verandah. It may be pointed out here that this verandah as shown is of somewhat small size in order to achieve the greatest economy, but that at comparatively little extra cost


SINGLE
FIG
Standard Cowl
Grass Thatch 9" thick
10 ft.
Rafters 3"-4" Gum Poles
3 Ties 3"-4" dia. Gum poles
Hoop Iron Straps securing all Rafters
Stock Casements 6 lights 12" x 10"
10 ft
Sill Brick on edge
2'-6"
15 ft dia
26 G Galv Iron Damp & Ant Course
Sand ½" thick
14" Brickwork set in 1:4 Cement Mortar For details see text.
SECTION
Lintels 6"x3" Timber [For alternative types see Fig III]
Stock Door 6'-6" x 2'-6"
ELEVATION
0
5
10
15 Ft
3 ft approx
Purlins of 10 G Galv wire 12 apart
Ties
Main Rafters
ROOF PLAN
Bricks flat on sand bed ½" thick Grouted with 1:4 cement.
Two Stock Casements 6 Lights 12" x 10"
Mosquito netted Frames to be placed inside Casements.
PLAN



· FIG. II ·

DOUBLE BRICK HUT.



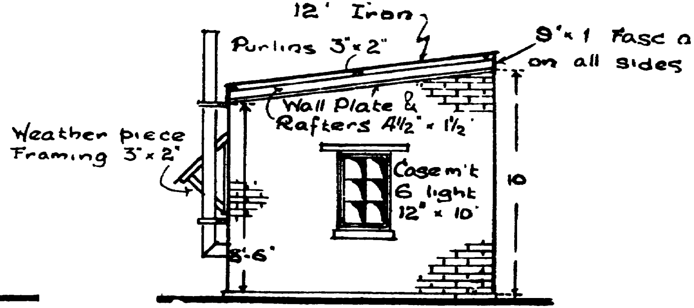


FIG. III

• KITCHEN, PANTRY • AND • BATHROOM •

Scale: 0 5 10 15 ft.

Note. Lintels.

(a). Brick Arch – 2 courses laid as shown 3" rise

(b) Timber – Deal 6" × 3" laid flat, to project 9" on each side of opening.

(c) Concrete – 1 : 2 : 4 concrete moulded in position, to be full width of wall 9 deep and to project 9 each side

[Reduced from Ms. 106] R.H.R. May '27

the comfort of the house may be vastly improved by using 9 ft. corrugated iron to cover in an 8 ft. verandah.

Kitchen, Pantry and Bathroom.—In conjunction with either of the above types of building, the block of rooms shown in Fig. III. may be built adjacent to the living rooms. This block is of cheap yet permanent construction, which is clearly shown in the drawing.

Costs.—The costs of the material have been estimated as follows:—

Single brick hut (Fig. I.)	£27	10	0
Double brick hut (Fig. II.)	88	0	0
Kitchen, pantry and bathroom (Fig. III.)	45	0	0

The costs of erection have purposely not been given, as these vary so greatly and depend on the type of labour employed and on the personal factor. It should be noted that the costs of materials have been estimated on the basis of Salisbury prices, and that cartage and railage are to be added, except in the case of bricks, which are assumed to be made on the farm at a cost of 12s. per thousand.

Conclusion.—It will be seen that the buildings are of the simplest possible character to secure the greatest economy, but that at the same time by the exercise of individual taste in matters such as decoration and arrangement a comfortable homestead may be built up from the units shown.

A few suggestions may not be out of place here. For instance, no ceilings are shown in the drawings, and it will be recognised that either the usual timber ceiling or a "steel" ceiling (of sheets of flat galvanised iron painted white and the joints covered with battens) would prove expensive on account of the circular shape. An idea that may prove useful is to form a ceiling of mosquito gauze 3 feet wide tacked to light cross timbers; this may be painted if desired, and will prove cool as well as serving the purpose of catching grass, etc., from the roof thatch.

Again, it might be well to point out an alternative scheme for a lightning conductor, so essential with thatched buildings. Barbed wire laid simply on top of the thatch to form a kind of metal cage is soldered to the galvanised iron

roof-ridging and carried down into the ground, where each wire is soldered to a paraffin tin set open end up. These tins retain water and form an excellent "earth." No sharp bends in the wires should occur, and where they cross they should be well soldered with good clean joints.

FARM DWELLINGS.

Quantities for Single Brick Hut.

(Drawing No. MS. 104.)

Material.	Number or quantity.	Length or size.
Bricks	8,000	
Cement	3 bags	
Lime	10 ,,	
Sand	4 cub. yards	
Gum poles, 3 inches to 4 inches	12 lengths	13 feet
,, ,, ,,	6 ,,	15 ,,
,, ,, ,,	3 ,,	18 ,,
,, ,, ,,	6 ,,	3 ,,
Deals, 6 inches by 3 inches	1 ,,	4 ,,
,, ,, ,,	1 ,,	3 feet 6 inches
,, ,, ,,	1 ,,	6 feet
Flat galvanised iron, No. 26 gauge	4 sheets	6 feet by 3 feet
Galvanised wire, No. 10 gauge	17 lbs.	
,, ,, No. 16 ,,	1 lb.	
Wire netting	140 feet	3 feet wide
Hoop iron	1 bundle	14 lbs.
Nails	7 lbs.	6 inch
,,	5 ,,	5 ,,
,,	5 ,,	4 ,,
,,	1 ,,	2 ,,
Stock casements, 6 light, 10 inches by 12 inches	3	
Stock casement frames	1 double	
,, ,, ,,	1 single	
Stock door and frame	1	6 feet 6 inches by 2 feet 6 inches
Standard cowl	1	
Mosquito netting	10 feet	4 feet wide

Quantities for Double Brick Hut.

(Drawing No. MS. 105.)

Material.	Number or quantity.	Length or size.
Bricks	23,000	
Cement	12 bags	
Lime	31 ,,	
Sand	16 cub. yards	
Gum poles, 3 inches to 4 inches	24 lengths	13 feet
,, ,, ,,	12 ,,	15 ,,
,, ,, ,,	6 ,,	18 ,,
,, ,, ,,	12 ,,	3 ,,
,, ,, ,,	16 ,,	14 feet 6 inches
,, ,, ,,	4 ,,	9 feet
,, ,, ,,	4 ,,	,,
,, ,, ,,	8 ,,	6 feet 6 inches
,, ,, ,,	2 ,,	10 feet
,, ,, ,,	2 ,,	16 ,,
Deals, 4½ inches by 3 inches	2 ,,	11 ,,
,, 3 ,, 2 ,,	6 ,,	7 feet 6 inches
,, 3 ,, 2 ,,	4 ,,	6 feet
,, 6 ,, 3 ,,	2 ,,	4 ,,
,, 6 ,, 3 ,,	2 ,,	3 feet 6 inches
,, 6 ,, 3 ,,	2 ,,	6 feet
,, 4½ ,, 1½ ,,	2 ,,	8 ,,
,, 4½ ,, 1½ ,,	4 ,,	4 ,,
,, 4½ ,, 1½ ,,	1 ,,	2 feet 6 inches
,, 4½ ,, 1½ ,,	4 ,,	5 ,, 6 ,,
,, 4½ ,, 1½ ,,	2 ,,	10 feet
Galvanised corrugated iron, No. 24 gauge	12 sheets	6 ,,
,, roofing screws	½ gross	2½ inch
Flat galvanised sheets, No. 26 gauge	10 sheets	6 feet by 3 feet
,, ,, ,, No. 24 ,,	6 ,,	6 ,, 3 ,,
Galvanised wire, No. 10 gauge	55 lbs.	
,, ,, No. 16 ,,	4 ,,	
Wire netting	530 feet	3 feet wide
Hoop iron	2 bundles	14 lbs.
Nails	20 lbs.	6 inch
,,	10 ,,	5 ,,
,,	10 ,,	4 ,,
,,	2 ,,	2 ,,
Stock casements, six light, 10 inches by 12 inches	6	
Stock casement frames	2 double	
,, ,, ,,	2 single	
Stock doors and frames	4	6 feet 6 inches by 2 feet 6 inches
Mosquito netting	44 feet	4 feet wide

Quantities for Kitchen, Pantry and Bathroom.

(Drawing No. MS. 106.)

Material.	Number or quantity.	Length or size.
Bricks - - - - -	11,000	
Cement - - - - -	5 bags	
,, - - - - -	1½ ,,	(for lintels if required
Lime - - - - -	12 ,,	
Sand - - -	9 cub. yds.	
Deals, 4½ inches by 1½ inches - -	6 lengths	12 feet (wall plates)
,, ,, ,, - -	5 ,,	12 feet (rafters)
,, ,, ,, - -	3 ,,	14 feet (door frames)
,, ,, ,, - -	1 ,,	10 ft. 6 in. ,,
,, 3 inches by 2 inches - -	6 ,,	12 feet (purlins)
,, ,, ,, - -	2 ,,	13 ft. (weather piece)
,, 6 inches by 3 inches - -	3 ,,	4 feet 3 inches (for lintels if required)
,, ,, ,, - -	3 ,,	3 feet 9 inches (for lintels if required)
Fascia, 9 inches by 1 inch - -	6 ,,	12 feet
Flooring, 6 inches by 1 inch - -	15 ,,	6 feet 6 inch doors)
,, ,, ,, - -	3 ,,	14 ,, 6 ,, ,,
Galvanised corrugated iron, No. 24 gauge	13 sheets	12 feet
,, ,, ,, ,, -	1 ,,	6 ft. (weather piece)
Flat galvanised iron, No. 26 gauge -	6 ,,	6 ft. by 3 ft. (damp course)
Hoop iron (roof straps) - -	30 feet	
Casement, 6 light, 12 inches by 10 inches, with frame, hinges, fastening, etc.		
Casement, 6 light, 10 inches by 8 inches, with frame, etc.		
Frame only, covered mosquito gauze, 3 feet by 2 feet		
Tee hinges, 12 inches - - -	6	

(*To be continued.*)

Poultry Husbandry.

CAUSES OF INFERTILE EGGS.

By A. Little, Poultry Expert.

The poultry breeder naturally wants as many fertile eggs during the hatching season as he can get. It should therefore be his endeavour to examine every possible contingency which may cause infertility and also every possible one which will promote strong fertility. Infertile eggs mean loss of time, money and labour. The following are some of the chief causes of infertility:—

1. If the breeding birds are penned in a bleak exposed spot, subjected to all the winds that blow, and have no shelter from the hot sun.

2. Damp or draughty houses.

3. Lack of sufficient scratching exercise.

4. An over-fatty condition.

5. Lack of sufficient *succulent* green food.

6. Too much mash, whether dry or wet, and too little grain.

7. Too much animal protein, viz., meat, meat meal or fish meal, etc.

8. The feeding of condiments or spices. These are answerable for not only infertility, weak germs, dead in shell and weak chicks, but result ultimately in illness and set up disease of the reproductive organs.

9. Insect vermin. Both the males and females in the breeding pen should be dipped or dusted regularly with some good insect powder, and it should be remembered that lice

attack all birds that are over-fat or too thin, *i.e.*, out of condition.

10. Unfitness of the male bird, due to his being a poor feeder, or one that lets the hens have all the food. He should go to roost with a full crop or have a good daily feed by himself and be given regularly a few scraps of meat.

11. Intestinal disorders, often due to the bird being too short on the leg, thereby dragging the abdomen through long grass, etc.

12. Lack of width of back, both in male and female, which means the lack of good-sized frame and good stamina, so necessary in a breeding bird.

13. Excess of abdominal fluff.

14. Highly strung or frightened hens will often produce infertile eggs.

15. A large comb in the male whereby it gets wet when drinking. The hot sun shining on it or the wind blowing on it, when wet, affects its condition, and so the general condition of the bird. Extra large combs too have a detrimental effect on the brain, causing loss of condition. Large overhanging combs in females which obstruct the eye are apt to cause nervousness in their owners. The result is infertile eggs.

16. Fighting between males and quarrelsomeness among the hens cause infertility. If breeding pens are adjacent, boards, sacking (which must be thick and without holes) or iron should be placed between each run 3 feet to 4 feet high; this acts also as shelter and protection.

17. Too large a number or too small a number of females to each male. A small breeding pen, say, up to ten or twelve hens for a vigorous male, is much more conducive to fertility than a hundred hens with eight or ten males. In the latter case the most vigorous males are always fighting instead of feeding themselves and attending to the hens.

18. If the male bird has long sharp spurs, these are not only dangerous to the bird himself and to the hens, but are another cause of infertility.

19. If a hen has a short breast-bone the abdominal muscles have to hold up a large portion of the abdomen; these muscles thus lose their elasticity, and, among other things,

the bird may develop abdominal dropsy and the egg organs will go wrong—infertility is the result.

20. Coarse big males are often the cause of infertile eggs.

It will thus be noted that there are many things the poultry keeper has to watch for in mating up in order to prevent infertile eggs.

Causes of "Dead in Shell."—Starting with one hundred fresh fertile eggs from healthy vigorous stock, every egg should and will hatch if properly incubated. The causes of "dead in shell" are usually due to weakness of the chicks and thus their inability to get out of the eggs. This is caused by:—

(a) Low vitality of the stock and weak germs.

(b) The eggs before being put into the incubator or under hens being kept too long.

(c) The eggs before being put into the incubator or under hens being kept too long at uneven or incorrect temperatures.

(d) The breeding stock being too old or too young.

(e) The breeding stock being too inbred.

(f) Too many females to one male.

(g) Too few females to one male.

(h) Poor feeding, *e.g.*, insufficient food, or poor quality and ill balanced rations.

(i) Over-fatty condition of breeding stock.

(j) Condiments and spices being given to the breeding stock.

(k) Insufficient green food.

(l) Insufficient exercise.

(m) Too high or too low a temperature when incubation is taking place.

(n) Uneven temperature in the incubator. If the incubator is allowed to go from one extreme to the other, or if it runs at too high or too low a temperature, there will be many dead in shell, and the majority of the chicks that do hatch will be weaklings which cannot be reared satisfac-

torily on the best of food and management. Eggs must not be subjected to extremes; the placing of cold eggs in a very warm incubator is very damaging to them.

(o) Too much moisture in the incubator, with the result that there is not sufficient evaporation from the eggs.

(p) Too little moisture, whereby the evaporation is *too* great and the membrane becomes dry and the chick is unable to break through.

(q) Insufficient ventilation, whereby the air in the room and incubator is too close.

(r) Draughts in the room.

It is the business of the poultry keeper to see that none of these factors is present. The hatching of a good number of strong chicks may make all the difference between success and failure.

Tobacco Varieties in Nyasaland.

The following extracts are taken from Circular No. 1, Agronomic Series, issued by the Department of Agriculture, Nyasaland:—

"A special word may here be said about a variety whose growth closely conforms to that of the Bonanza class. This is the Hickory Pryor, which has lately been introduced from Rhodesia and which exhibits vigour of growth, lightness of colour and early maturity, and which gives lemon yellow and a high percentage of other desirable colours in cured leaf with a small supply of phosphorus. It stands a wet season very well, and, from leaf which has become not quite ripe, a leaf of good colour and aroma, but little body and elasticity, is produced. In comparison with our standard varieties, under good climatic conditions and cultural methods the yield is as good; rate of burn is often rather fast. Growers should, however, make up their minds which varieties to grow, and persuade their neighbours on the same soil series to adopt the variety which they are convinced is the best, and to adopt cultural methods suited to it, such as early dry season cultivation and the fertiliser formula standard to the soil series. In this connection it is especially urged, in view of the fact that in future quality will play an increasingly important part in profitable tobacco growing, that a community of growers study the methods leading to a high percentage of profitable grades."

Confusion in Names.—"This brings us to the great difference in some bright tobacco varieties. It has been noticed that seed of a Hickory Pryor variety is being issued to planters, some seed having been obtained from the U.S.A. and other seed having been obtained locally and originating from Rhodesia. It should be noted that in the U.S.A. bright tobacco belts Hickory Pryor is recognised as standard, but that Hickory Pryor originating from Rhodesia is unlike this variety and conforms to the characteristics of the Bonanza class. Each type has numerous advantages, but this con-

fusion in names should not occur. This is an argument in favour of using seed of well-recognised varieties from estates in Nyasaland alone. It should be realised that tobacco seed will keep seven years under good conditions, and there is no reason why growers should not have a stock of seed from a good season and from well selected plants to last several seasons."

Aroma of Tobacco Types.—"The aroma or flavour of smoking tobacco varies according to the soils on which and the varieties from which the leaf was grown. Just as the flavour and preservative properties of the hop, which are due to the resins and bitter substances, vary according to the climatic or soil conditions where the hop is grown, so does the aroma of tobacco, influenced by soil and climate, vary according to the resinous compounds, on the authority of Dr. Garner, the greatest authority on tobacco chemistry.

"These compounds influencing aroma contain no nitrogen, and apparently a large proportion of nitrogen compounds in the leaf to the other non-nitrogenous bodies has little effect on the aroma in comparison with other bodies much more potent in effect. The aroma of much of the Nyasaland tobacco is admittedly different to that of corresponding American tobacco types, but to state that all Nyasaland tobacco has a 'twang' or 'tang' which may be described as an unpleasant after-taste may be an advantageous trade expression, but is scientifically untrue. The aroma of the bulk of the leaf grown on the recognised Likangala, Midima, Zomba Road, Vua, Tuanjati and other bright tobacco soils from varieties suited to these soils is, when properly matured, of pleasant smoking flavour and without undesirable after-effects for the average smoker, who usually is quickly accustomed to the taste which may differ from Virginia or other tobacco. A preference is often established in a short time.

"The introduction of improved varieties such as the Hickory Pryor strain, Cash, etc., and improved methods of spacing, topping and curing, have doubtless improved the aroma of many Nyasaland tobacco types. Much more study is required, however, before sweeping and scientifically unsound generalisations are made about any particular type."

Report of the Eighth Annual ›desia Egg-

SECOND PERIOD.

FROM 29th MARCH TO 25th APRIL, 1927.

Ninety-eight birds were laying during the four weeks,' and produced 1,705 eggs, an average per bird of 17.39 eggs.

Twenty birds in the heavy breed section have been laying and have produced 345 eggs, an average per bird of 17.25 eggs.

Seventy-eight birds in the light breed section have been laying and have produced 1,366 eggs, an average per bird of 17.51 eggs.

The total weight of eggs in the four weeks was 223 lbs. 8 2-16 ozs.

The maximum number of eggs laid in one day was 67 on the 3rd and 25th April, and the minimum 50 on the 24th April.

The average number of eggs laid per day was 60.89 eggs.

Pen 14 laid 117 eggs in the four weeks.
Pen 16 laid 104 eggs in the four weeks.
Pen 10 laid 102 eggs in the four weeks.
Pen 20 laid 101 eggs in the four weeks.
Pen 2 laid 98 eggs in the four weeks.

Of the trap-nested birds the following laid in four weeks:—

26 eggs—Pen 4, No. 118.
25 eggs—Pen 16, No. 176.
24 eggs—Pen 10, No. 148.
23 eggs—Pen 8, No. 140; Pen 20, No. 200.
22 eggs—Pen 1, No. 101; Pen 6, No. 126; Pen 9, No. 142; Pen 11, No. 154; Pen 12, No. 160; Pen 17, No. 183; Pen 19, No. 192.

The three leading positions in each section are as follows:—

HEAVY BREEDS.

1st.—H. Dunley Owen, Australorpingtons	183 eggs—26 lbs. 4 3-16 ozs.
2nd.—F. C. Trueman and Sons, Rhode Island Reds	183 eggs—25 lbs. 8 11-16 ozs.
3rd.—Mrs. C. M. Syfret, Australorpingtons	169 eggs—21 lbs. 11 3-16 ozs.

LIGHT BREEDS.

1st.—Gordon Cooper, Anconas	201 eggs—24 lbs. 9 5-16 ozs.
2nd.—W. A. Bull, White Leghorns	179 eggs—23 lbs 15 15-16 ozs.
3rd.—Mrs. M. M. C. Bragge, White Leghorns	194 eggs—23 lbs. 15 3-16 ozs.

The number of eggs for this (the second) period, viz., 1,705, is a satisfactory increase of 62 over the last period. The number laid during the second period of the last test was 1,656. As will be noted, the total weight for this period is 223 lbs. 8 2-16 ozs., an increase of 19 lbs. 2 4-16 ozs. over last period, and of 18 lbs. 6 4-16 ozs. over the same period of the last test.

The majority of birds are laying good-sized eggs, and some really large ones, notably Nos. 101, 105, 106, 107, 108, 109, 110, 111, 113, 116, 117, 118, 120, 121, 124, 128, 143. 153, 165, 174, 178, 189, 191, 196, 197, 198, 199.

Deaths.—One, viz., Hen 102, Pen 1, which died suddenly on the night of the 18th, and was replaced on the 21st. The post-mortem revealed death as due to hæmorrhage caused by ruptured liver.

Poultry Industry.

1926-1927 EGG LAYING TESTS.

By A. LITTLE, Poultry Expert.

The following figures and comparisons will be of interest to poultry breeders in this Colony, especially to those who have pens on the present Southern Rhodesia egg laying test and to those who have been entrants in previous tests.

The results are gratifying to this Colony, especially in view of the fact that it is only comparatively recently that poultry breeding to any extent has been taken up in Rhodesia.

The average per bird has been taken in those tests where there are four birds in a pen, viz., Port Elizabeth and the Western Province tests, and where there are six birds to a pen, viz., the Scottish test and the North-Ireland test, and calculated on a basis of five birds to a pen as in the central egg laying test at Glen and the Southern Rhodesia test.

Highest Pen Record.

	Glen.	Port Elizabeth.	Western Province.	Southern Rhodesia.	Scottish.	North Ireland.
Light breeds ...	1,189	1,086	1,102	1,169	1,035	—
Heavy breeds	946	1,071	1,022	985	1,045	—

Highest Individual Records.

Light breeds ...	265	263	261	259	273	—
Heavy breeds	254	243	238	241	279	—

Average per Bird.

	181.7	137.5	187.79	189.7	182.46	189.66

Movements of New Settlers.

New Arrivals.—The following new settlers arrived in the Colony during the month of April, 1927:—

A. G. Teesdale.—Arrived from England on 1st April, and is with Mr. H. C. S. Ford, Sinoia.

L. G. Vuyk.—Arrived from Holland on 2nd April, and joined Mr. L. S. Myring, M'Sorodoni, Concession, for tuition.

J. Kavanagh.—Arrived from the Union on 3rd April, and proceeded for a period of training to Mr. R. T. Wrightson, Umvukwes.

Capt. and Mrs. R. D. Duff.—Arrived from England on 6th April, and have been accommodated on Mr. A. C. Ackerman's farm, Que Que.

Capt. H. K. Murray.—Arrived from England on 6th April, and is now with Mr. H. D. Mellor, Lydiate.

Mr. and Mrs. F. A. Bailey.—Arrived from England on 11th April, and have arranged for training with Capt. Shaw, Miegunyah, Nyabira.

J. Snoep.—Arrived from England on 11th April, and joined Mr. F. E. Badenhorst, Bindura.

Capt. H. E. F. Aylmer.—Arrived from Union on tour of inspection.

R. H. Haybittel.—Arrived from Union on 11th April, and is now on Mr. W. Grieve's farm, near Salisbury.

A. F. G. Lineham.—Arrived from England on 13th April, and joined Mr. D. C. Forbes, Arcturus.

C. H. Clayton.—Arrived from New Zealand on 13th April, and has since been placed with Mr. J. Bell, Copshaw, Salisbury.

J. A. Faed.—Arrived from England on 13th April, and proceeded for training to Col. Royston Pigott, Umvukwes.

C. J. Gibbs and F. R. M. Buckell.—Arrived from England on 13th April, and are now undergoing training on Melfort Estate (Col. Haslam).

H. M. Grantham.—Arrived from England on 13th April, and joined Mr. J. Parker, Ruati, Inyazura, for tuition.

A. Cushny.—Arrived from Union on 19th April, and was placed with Mr. M. Wessels, Dunluce, Salisbury.

H. S. Wilson.—Arrived from Great Britain on 19th April, and proceeded to the Maryland Estate, Macheke.

D. Jones.—Arrived from England on 20th April, on tour of inspection.

Major C. R. Jackson.—Arrived from England on 20th April, and is now with Mr. G. R. Syfret, Salisbury.

V. W. Brown.—Arrived from England on 22nd April, and arranged with Mr. A. C. Henderson for a period of training on Great B, Mazoe.

A. J. Symes.—Arrived from England on 23rd April on tour of inspection.

E. N. Photeadis.—Arrived from Greece on 25th April, and is viewing land.

H. D. Matthews.—Arrived from England on 26th April on tour of inspection.

T. A. Harley.—Arrived from England on 27th April, and proceeded to Mr. H. Kneiser, Eldorado.

F. Pampado.—Arrived from Italy on 27th April, and is reported to be undergoing a period of training with Mr. H. G. Kileff, Salisbury.

W. W. Miller.—Arrived from England on 27th April on tour of inspection, and left for Nyasaland a week later.

Capt. Saumarez.—Arrived from England on 27th April on tour of inspection.

K. Whitmarsh Gray.—Arrived from Nyasaland on 28th April, and is viewing land in various districts.

R. J. Comben.—Arrived from England on 29th April, and proceeded for training to Capt. J. M. Moubray, Shamva.

E. S. Eldridge.—Arrived from England on 29th April, and is now with Mr. D. N. Brakspear, Makwiro.

T. D. Dixon.—Arrived from England on 29th April, and was placed for training with Mr. A. J. Bradshaw, Trafalgar, Felixburg.

R. N. Cobbold.—Arrived from England on 29th April, and joined Col. Haslam on Melfort Estate for tuition.

W. L. Polley.—Arrived from England on 29th April, and proceeded to Mr. J. Fraser-Mackenzie, Lone Cow Estate, Banket.

Correspondence.

[*No responsibility is accepted by this Journal for the views expressed by correspondents.*]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Commercial Poultry Farming.

By the same post I received this month's Journal and some poultry bulletins.

An article in the Journal contradicts most of the advice given in the bulletins. I am told that the article does not dogmatise, and the points raised by our Poultry Expert are not of major importance. If the former, my Nuttall needs revision; if the latter, then the bulletins are superfluous.

Nothing being said to the contrary, the Minister of Agriculture and Lands authorised both, and that is confusing.

The *statement that only six* poultry farms are solvent is either a wild guess or returns are not confidential. If true, it is the wrong kind of publicity for the country.

One thousand pounds is given as the least capital to start with. The owner of one of our show farms told the writer he started on £90.

Senator Campbell stated (Union *S.A. Agricultural Journal*, January, 1913): "Many started in Natal (farming) with half-a-crown and are now worth a hundred thousand pounds. Those who had least did best." Is this country so much inferior or are we afraid of competition?

Again, "Anconas have proved their worth." Where? The only substantiated proof is the laying test.

Every breeder is insulted by the insinuation that no reliable chicks are for sale. Porritt offers 65,000, and his record is public property.

I am told to ask only the man who knows. The trouble is, so many think they know, and advertise the fact.

Farmers' articles hitherto have dealt with practice. A jumble of heretical theory, offered without any proof, is worse than confusing.

I am, etc.,

J. BELLRINGER.

Ashcroft, Gwelo,
24th April, 1927.

[If our correspondent will refer to the article in question he will see that Mr. Gordon Cooper uses these words: "The methods described are those I consider best suited to my own special conditions, and they would have to be modified or altered according to the circumstances of the individual." This is the whole tenor of the article. Mr. Cooper has built up a successful poultry business, and even though certain of his methods are not those advocated by the Poultry Expert, the latter agrees that the article contains much that is helpful. We specially asked the Poultry Expert to define

the points of difference, and readers can therefore decide for themselves what to accept or reject.

The statement that only six poultry farms are solvent is not confirmed by the Poultry Expert, therefore the point need not be laboured.

We do not dispute the fact that many successful poultry keepers have started on less capital than £1,000. Mr. Cooper, however, merely tenders the advice that the capital of anyone who has to depend solely on the production of eggs should not be less. He is writing from his own experience.

We fail to find any insinuation in the article that no reliable chicks are for sale.

Mr. Bellringer's indictment of "a jumble of heretical theory offered without any proof" is surely undeserved. As we have already pointed out, Mr. Cooper is merely describing his own methods, and the article must be read in this light.—Editor.]

Review.

SHORTHORN DAIRY RECORDS, SOUTH AFRICA.

We have received the first volume of the Shorthorn Dairy Records, which has been issued primarily for the purpose of permanently recording the yields of milk and butter fat given by cows and heifers of Shorthorn and Lincoln Red Shorthorn breeding. The volume contains the milk records of cows and heifers which have produced the minimum standard required, and which, having completed their lactation periods, have re-calved by the 31st January, 1927. The records of 83 cows from 12 herds are published; 83 records are of cows entered in the S.A.S.H.B. from 12 herds, and 6 records are those of grade cows entered in the grading register from the herd.

The highest individual yield of butter fat is 567.402 lbs. in 300 days from 14,533 lbs. of milk (3.9 per cent. butter fat), given by Mr. J. H. Diesel's cow Floradale Stella; while the highest individual yield of milk is 15,328 lbs. in 300 days, containing 525.049 lbs. butter fat (3.426 per cent. butter fat), produced by Mr. F. H. Holland's cow Klip-Rug Cherry. Included in the volume is the first register of 43 cows which have qualified by butter fat yield as bull breeders, and also the first list of 38 qualified pedigree dairy Shorthorn bulls.

The volume contains numerous illustrations of prominent Shorthorns, is well printed and is admirably adapted for the purpose for which it is intended, viz., to build up a reliable type of dairy or dual-purpose Shorthorn in South Africa.

Southern Rhodesia Veterinary Report.

January, 1927.

AFRICAN COAST FEVER.

UMZINGWANE DISTRICT.—Fresh outbreaks occurred on the farms Bushy Park, Woodlands and Heany Junction. The mortality during the month was as follows:—Essexvale South, 147; Essexvale East, 92; Essexvale Central, 3; Bushy Park, 2; Woodlands, 1; Heany Junction, 1; The Range, 2.

MATOBO DISTRICT.—On the infected farm Sibuntuli one native kraal, which had previously escaped the disease, became infected. The total number of deaths on Malaje and adjoining farms was 45.

GWANDA DISTRICT.—Smears from a calf on the farm Longuville showed the organisms of Coast Fever. It is impossible to suggest the source of infection in this case. It is possible that an ox which died on this farm in May, 1924, and which had been moved four weeks earlier from an infected area near Bulawayo, was actually infected with Coast Fever.

UMTALI DISTRICT.—No fresh outbreaks. Mortality at existing centres of infection: Maonza, 1; Zimunya's Town, 3.

GWELO DISTRICT.—In October last a fresh outbreak occurred on the farm Clearwater at Hunter's Road Station; one dead only. No further cases occurred until 10th January, between which date and the end of the month 12 cases occurred.

ANTHRAX.

One case occurred amongst the cattle on the farm Glen Divis; all in-contact animals were vaccinated.

HEARTWATER IN CATTLE.

This disease was diagnosed near Gwaai in the Nyamandhlovu district.

HORSE-SICKNESS.

A few deaths from this disease.

SPECIFIC OPHTHALMIA OF CATTLE.

A number of cases reported from the Melsetter and Gwelo districts.

IMPORTATIONS.

Horses, 23; donkeys, 42; cows, 25; sheep, 1,028; goats, 278; pigs, 3.

EXPORTATIONS (CATTLE).

To Union of South Africa (slaughter cattle for consumption in the Union), 151; to Belgian Congo (slaughter cattle), 1,713; to Portuguese East Africa (slaughter cattle), 81.

EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa: Sheep, 20; goats, 60. To Belgian Congo: Pigs, 187; sheep, 165. To Northern Rhodesia: Pigs, 31; sheep, 190. To Portuguese East Africa: Sheep, 72.

February, 1927.

AFRICAN COAST FEVER.

Umzingwane District.—Fresh outbreaks occurred on the farms Adams, Limerick, Plot 82, Essexvale, and Swaithes. All these centres are within the quarantine area and in the immediate vicinity of previously infected areas. The mortality during the month was as follows:—Essexvale, 201; Bushy Park, 1; The Range, 17; Adams, 4; Limerick and Plot 82, 7; Swaithes, 1.

Matobo District.—A fresh outbreak occurred at some native kraals on the eastern section of the Matopo Reserve adjoining the previously infected farm Glen Lategan. The mortality during the month was as follows:—Malaje and adjoining farms, 42; Matopo Reserve, 2.

Insiza District.—A fresh outbreak occurred on the farm Pioneers' Rest; one death.

GWANDA DISTRICT.—A fresh outbreak occurred on the north-western section of the Wenlock Block, in the neighbourhood of the Malaje infected centre in the Matobo district. The mortality was 8 head.

The system of more intensive supervision organised the previous month, not only in the quarantine areas in the districts referred to above, but in a large area surrounding them, is working most satisfactorily. The fresh outbreaks recorded were discovered at an early stage before any heavy degree of infection can have been disseminated. In this area of intensive supervision close on half a million head of cattle are inspected at least once a week, and every dipping supervised by an officer of the Department.

VICTORIA DISTRICT.—Smears from a calf on the Victoria commonage showed Koch's bodies. It is several years since Coast Fever infection existed in the Victoria district, and it is difficult to suggest the source of infection in this case. The herd involved was temperatured daily, but no further sign of disease was found.

UMTALI DISTRICT.—No fresh outbreaks. Ten head were destroyed on the infected farm Zimunya's Town on showing a high temperature.

GWELO DISTRICT.—No fresh outbreaks; on the infected farm Clearwater 11 deaths occurred.

CHARTER DISTRICT.—A fresh outbreak occurred on the farm Wildebeestelaagte, with a mortality of three head.

MELSETTER DISTRICT.—Smears from a cow which died on the farm Small Deel were somewhat suspicious of African Coast Fever, and as a matter of precaution the farm was placed in quarantine.

HEARTWATER IN CATTLE.

A virulent outbreak of this disease occurred at West Nicholson in a lot of over 200 bulls *en route* from various districts to the Nuanetsi Ranch, and 64 head succumbed.

ANTHRAX.

Further cases occurred at kraals on the Ntabezinduna Reserve, Bubi district. The infected and in-contact herds were vaccinated.

EPHEMERAL FEVER (THREE-DAY SICKNESS OF CATTLE).

This disease, which has not been much in evidence in recent years, appeared in the Hartley, Lomagundi, Salisbury, Mazoe and Marandellas districts. The mortality reported was very slight.

SWEATING SICKNESS OF CALVES.

A mortality of 20 head was reported from the Victoria district and a few from the Salisbury district.

CUTANEOUS MYIASIS (SCREW WORM OF CATTLE).

Prevalent in the Salisbury, Mazoe, Lomagundi, Gatooma, Umtali, Umzingwane and Gwanda districts. The District Veterinary Surgeon, Umtali, reports that where five-day dipping has been carried out for some time the bont-legged tick is greatly reduced in numbers, and following this is a marked reduction in the number and severity of cases of screw worm.

HORSE-SICKNESS.

The following mortality was reported:—Inyati, 1; Plumtree, 1; Figtree, 1; Umzingwane, 1; Insiza, 1; Hartley, 2; Victoria, 2; Odzi, 1; Enkeldoorn, 4; Daisyfield, 3; Salisbury, 4; Mazoe, 3; Marandellas, 1.

IMPORTATIONS.

Bulls, 2; heifers, 31; donkeys, 200; mules, 18; goats, 250; sheep, 707; pigs, 36.

EXPORTATIONS (CATTLE).

To Union of South Africa for consumption in the Union, 77; to Belgian Congo (slaughter cattle), 695; to Portuguese East Africa (slaughter cattle), 112.

EXPORTATIONS (MISCELLANEOUS).

To Belgian Congo: Pigs, 246.

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

APRIL, 1927.

Pressure.—The mean pressure for the month was generally about normal, being high to the south and east and low to the north and west. It varied from 0.041 inch above normal at Fort Victoria to 0.031 inch below normal at Salisbury.

Temperature.—The mean temperature during the month was slightly above normal, varying from 4.5° F. above normal at Matopos Estate to 1.0° F. below normal at Umtali and Riverdene North. The mean day temperatures were generally slightly below normal, varying from 6.1° F. above normal at Matopos Estate to 4.4° F. below normal at Umtali. The mean night temperatures were above normal, varying from 4.1° F. above normal at Essexvale to 1.8° F. below normal at Sinoia.

Relative humidity during the month was about normal, varying from 7 per cent. above normal at Salisbury and Matopos Estate to 7 per cent. below normal at Enkeldoorn.

Rainfall.—Rainfall for the month of April amounted to 0.97 inch, as compared with a normal of 0.93 inch.

RAINFALL.

STATION.		1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
ZONE A.:					
Bubi—					
Bembesi Railway	...	1.61	...	12.68	23.00
Imbesu Kraal	...	...	...	...	...
Inyati	...	.13	...	12.10	24.61
Judsonia	...	.95	1.22	11.82	n.s.
Martha Farm	...	1.53	.85	15.31	n.s.
Shangani Estate	...	1.14	nil	13.99	22.69
Bulalima-Mangwe—					
Centenary	...	.54	.63	12.71	n.s.
Kalaka	...	...	...	14.07	22.50
Riverbank	...	1.54	.39	14.42	23.04
Solusi Mission	...	.09	.76	15.09	24.02
Bulawayo—					
Fairview Farm	...	.76	...	13.39	22 00
Keendale	...	.31	.53	14 88	21.63
Lower Rangemore	...	1.01	.15	13.62	23.41
Observatory	...	.67	nil	15.40	23.94
Gwelo—					
Dawn	...	2.12	nil	13.86	24.71
Delano Estate	...	.18	.70	22.64	n.s.
Gwelo Gaol	...	2.17	.79	21.55	26.20
Riversdale Estate	...	...	...	10.20	n.s.
Somerset Estate	...	.84	.28	17.40	25.05
Insiza—					
Orangedale	...	1.14	.89	16.10	27.81
Shangani	...	...	.06	11.41	23.17
Thornville	...	1.41	.15	12.96	24.72
Nyamandhlovu—					
Edwaleni	...	...	...	6.99	23.12
Gwaai Reserve	...	.45	.64	13.96	n.s.
Impondeni	...	.53	...	16.45	n.s.
Naseby	...	1.44	.42	15.69	21.99
Nyamandhlovu Railway	...	.47	nil	10.51	22.52
Sebungwe—					
Gokwe	...	1.72	.19	29.22	28.22
Umzingwane—					
Springs	...	.88	.16	15.64	24.17
Wankie—					
Matetsi Railway	...	.93	.09	24.87	29.54
Ngamo Railway	...	1.27	1.23	18.84	28.61
Sukumi	...	1.48	.92	25.16	n.s.
Victoria Falls	...	...	.55	21.10	27.69
Wankie Hospital	...	.23	.96	20.02	22.76
Waterford	...	...	...	...	...
ZONE B.:					
Belingwe—					
Bickwell	...	.65	.25	15.73	23.75
Bulalima-Mangwe—					
Bruwapeg	...	.14	...	9.55	n.s.
Edwinton	...	.25	...	13.85	22.17

RAINFALL—*(Continued)*.

Station.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
Zone B.—(Continued)				
Bulalima-Mangwe (continued)—				
Empandeni ...	.21	.18	12.59	21.51
Garth ...	.34	.09	18.58	25.34
Maholi ...	.57	...	18.77	23.23
Retreat ...	.53	.12	17.09	21.99
Sandown ...	.45	.32	13.01	n.s.
Semokwe Reserve ...	1.45	.07	11.19	n.s.
Tjankwa ...	...	...	21.16	24.32
Tjompanie ...	1.47	.53	24.04	23.20
Chibi—				
Nuanetsi Homestead ...	1.77	.68	5.26	15.92
Gwanda—				
Antelope Mine ...	...	...	16.36	20.14
Gwanda Gaol ...	.64	.14	11 00	21.05
Limpopo ...	.88	.07	5.48	n.s.
Mazunga ...	2.76	.87	10.10	16.45
Tuli ...	.79	nil	8.72	14.29
Insiza—				
Albany ...	1.47	.73	13.09	22.44
Filabusi ...	.45	.34	9.63	21.51
Fort Rixon ...	1.78	.82	13.77	22.45
Inyezi	.87	.32	12.87	21.98
Lancaster ...	.88	.13	10.58	n.s.
Wanezi Mission ...	1.23	.18	11.11	n.s.
Matobo—				
Bon Accord ...	.37	.01	11.71	n.s.
Fort Usher ...	1.16	.21	16 35	n.s.
Holly's Hope ...	.47	.20	13.80	21.72
Longsdale ...	.10	.13	13.21	n.s.
Matopo Mission ...	1.13	.17	17.18	26.52
Matopo School ...	.70	...	9.16	n.s.
Mtshabezi Mission ...	.83	.10	9.31	34.82
Rhodes Matopo Park ...	.99	nil	16.13	23.95
Wenlock Ranch ...	nil	...	7.63	n.s.
Umzingwane—				
Balla Balla ...	1.42	.30	15.40	24 13
Essexvale ...	.83	.15	15.12	23.51
Heany Junction ...	.48	.10	15.74	26.15
Hope Fountain ...	...	...	13.55	25.62
Zone C.:				
Charter—				
Bushy Park ...	6.84	...	26.77	31.02
Enkeldoorn ...	1.51	.18	18.92	25.25
Marshbrook ...	3.32	.78	27.85	30.62
The Range ...	2.12	.46	27.99	32.88
Vrede ...	.89	nil	13 03	30.69
Chilimanzi—				
Beacon Hill ...	2.06	.17	21.03	n.s.
Central Estates ...	4.58	.36	26.78	32.23

RAINFALL—(*Continued*).

STATION.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Chilimanzi (continued)—				
Fourie's Post ...	.90	nil	20.43	n.s.
Orton's Drift ...	1.51	.21	18.31	32.23
Sebakwe Post ...	1.31	nil	22.42	n.s.
Umvuma Railway ...	1.76	.55	16.95	29.75
Gwelo—				
Cross Roads ...	3.61	.05	22.63	28.41
East Clare Ranch ...	1.71	.11	18.37	n.s.
Globe and Phœnix Mine ...	2.39	1.62	19.97	29.44
Indiva ...	2.89	.47	20.30	n.s.
Iron Mine Hill ...	...	...	21.57	n.s.
Lyndene ...	2.33	.17	18.82	n.s.
Lannes Farm ...	1.63	.06	12.33	n.s.
Rhodesdale Ranch ...	2.91	.05	25.45	29.01
Woodendhove ...	2.84	...	28.63	30.79
Hartley—				
Ardgowan ...	3.29	.67	32.47	33.26
Balwearie ...	1.22	...	27.23	n.s.
Battlefields ...	3.50	.52	28.43	30.21
Beatrice ...	2.35	1.19	29 95	34.30
Carnock ...	2.70	1.52	25.81	33.21
Cromdale ...	2.51	2.19	29.48	n.s.
Deweras Store ...	1.63	1.01	28.05	n.s.
Eiffel Blue Mine ...	1.97	1.26	28.47	n.s.
Elvington ...	3.76	.86	28.27	32.76
Gatooma ...	1.53	.35	39.07	33.53
Gatooma Experiment Station	2.45	.64	33.14	n.s.
Gowerlands ...	2.84	1.40	29.51	31.47
Handley Cross ...	1.29	.57	26.50	n.s.
Hartley Gaol ...	1.42	.73	29.29	32.63
Hopewell ...	1.84	1.02	25.15	33.69
Jenkinstown ...	...	...	24.88	32.83
Maida Vale ...	1.36	.30	30.91	n.s.
Nyadgori ...	2.32	.31	28.15	n.s.
Palham ...	2.12	2.21	24.10	34.78
Ranwick ...	2.16	.81	33.36	32.54
Rocky Spruit ...	...	...	...	...
Thornby ...	...	...	...	...
Thorndyke ...	2.14	...	18.32	n.s.
Lomagundi—				
Argyle ...	3.38	...	21.01	30.77
Baguta ...	1.50	...	20.41	31.57
Between Rivers ...	5.21	3.38	32.60	n.s.
Tsanunu ...	2.58	...	17.08	n.s.
Citrus Estate ...	2.94	1.83	25.55	29.84
Darwendale ...	3.29	3.52	26.00	30.98
Debera ...	...	...	...	...
Devonia ...	5.33	2.54	32.98	30.30
Dingley Dell ...	5.04	1.57	21.38	n.s.
Elinda ...	...	...	...	...
Gambuli ...	2.69	1.83	24.32	33.63

RAINFALL—(*Continued*).

Station.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Lomagundi (continued)—				
Msina ...	4.14	2.64	26.39	n.s.
Impingi ...	4.71	1.84	29.75	n.s.
Kapiri ...	3.91	3.15	29.42	n.s.
Lone Cow Estate ...	3.74	2.45	24.42	31.76
Mafoota ...	3.54	2.22	24.97	n.s.
Maningwa ...	1.97	2.30	24.02	30.89
Mica Field ...	3.50	.86	28.30	n.s.
Montrose ...	4.18	4.14	29.04	n.s.
Mpandegutu ...	3.75	2.03	29.80	n.s.
Mukwe River Ranch ...	3.66	3.41	28.25	29.00
North Banket ...	4.05	3.95	32.13	n.s.
Nyapi ...	1.72	3.00	29.11	n.s.
Nyarora ...	2 56	1.48	25.22	n.s.
Nyati ...	2.35	...	20.99	n.s.
Palm Tree Farm ...	5.10	3.43	31.66	30.83
Puri ...	3.88	1.11	28.27	n.s.
Raffingora ...	4.14	.72	27.45	n.s.
Richmond ...	3.42	1.97	29.09	n.s.
Robbsdale ...	4.31	2.16	22.96	n.s.
Romsey ...	4.03	3.32	25.11	n.s.
Silater Estate ...	3.67	5.28	31.29	n.s.
Sinoia ...	1.77	1.66	26.99	31.10
Sinoia's Drift ...	...	...	17.55	n.s.
Sipolilo ...	3.26	3.03	31 65	30.94
Umboe ...	3.60	...	23.55	n.s.
Umvukwe Ranch ...	2.83	2.80	26.20	31.65
Woodleigh ...	3.72	1.39	28.29	n.s.
Yeanling ...	2.55	4.78	32.52	n.s.
Marandellas—				
Rocky Spruit ...	2.65	1.92	31.35	n.s.
Salisbury—				
Avondale (Broadlands) ...	1.88	.97	21.86	32.27
Ballineety ...	1.53	2.44	22.66	n.s.
Botanical Experiment Station	3.47	1.92	20.32	31.64
Bromley ...	2.29	1.71	26.69	33.21
Cleveland Dam ...	1.95	1.18	26.50	31.54
Gwebi ...	3.23	3.13	26.28	32 55
Hillside ...	...	...	...	...
Lochinvar ...	...	...	15.79	29.74
Manor Farm ...	2.27	...	25.81	n.s.
Salisbury Agricultural Dept.	2.13	2.37	23.34	n.s.
Sebastopol ...	2.34	4.59	25.80	33.32
Stapleford ...	4.56	4.47	27.92	34.34
Tobacco Experiment Station	1.62	1.72	16.15	n.s.
Western Commonage ...	2.43	.96	21.19	33.61
Sebungwe—				
Sikombela ...	.70	.40	23.37	32.71
Wolverley ...	2.06	1.81	23 20	n.s.

RAINFALL—(*Continued*).

Station.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
Zone D.:				
Darwin—				
Cullinan's Ranch ...	3.22	...	25.04	n.s.
Fountains ...	3.32	.46	19.52	n.s.
Mount Darwin ...	3.90	.22	25.69	30.82
Rusambo ...	3.13	.27	20.78	n.s.
Inyanga—				
Inyanga ...	6.27	nil	26.27	37.86
Juliasdale ...	9.30	1.85	30.77	n.s.
Rhodes Estate ...	9.81	2.07	33.04	39.40
Makoni—				
Ardlamont ...	4.97	...	20.63	n.s.
Eagle's Nest ...	2.70	1.77	27.65	33.83
Nyogeni ...	1.57	4.18	24.50	n.s.
Wensleydale ...	4.64	...	21.55	n.s.
Marandellas—				
Fault Farm ...	3.84	4.75	31.76	n.s.
Mazoe—				
Argyle Park ...	2.81	1.75	24.39	n.s.
Atherstone ...	3.84	1.75	27.62	n.s.
Bellevue ...	2.16	2.60	26.90	n.s.
Benridge ...	4.35	2.09	26.45	n.s.
Bindura ...	3.60	.96	26.47	33.78
Ceres ...	4.64	2.18	30.89	36.31
Chipoli ...	3.31	1.59	23.79	32.30
Citrus Estate ...	4.20	2.63	28 15	32.74
Craigengower ...	3.81	.88	25.61	31.63
Dandejena ...	6.72	1.27	26.01	n.s.
Donje ...	4 55	1.95	31.29	n.s.
Frogmore ...	7.26	1.20	29.47	n.s.
Glen Divis ...	6.65	1.10	30.67	n.s.
Glen Grey ...	3.63	.69	26.18	n.s.
Hinton ...	2.96	.63	23.65	n.s.
Great B ...	1.22	1.72	26.05	n.s.
Kilmer ...	4.18	...	25.28	32.46
Kingston ...	6.28	1.98	31 85	36.26
Mazoe ...	5.03	2.15	28.97	33.04
Maienzi ...	2.19	2.00	22 05	n.s.
Marston ...	1.52	...	19.32	n.s.
Mgutu ...	2.48	2.72	26.97	n.s.
Muripfumba ...	5 56	.85	26.15	n.s.
Omeath ...	6.46	1.11	34.36	31.88
Pearson Settlement ...	4.32	...	25.69	n.s.
Pembi Ranch ...	5.99	...	27.77	n.s.
Riversdale Estate ...	2 73	...	27.73	n.s.
Ruia ...	7.41	1.84	32.33	35.68
Horta Ranch ...	3.48	.69	29.21	32.71
Rustington ...	3.29	1.56	24.94	n.s.
Shamva Mine ...	...	...	20.90	33.72

RAINFALL—(*Continued*).

STATION.		1927. Mar.	1927. April.	Total to end of period. *	Normal rainfall to end of period.
Zone D.—(Continued)					
Mazoe (continued)—					
Stanley Kop	...	5.26	1.49	27.28	31.33
Sunnyside	...	5.69	1.81	36.04	33 22
Teign	...	5.71	1.88	27.97	n.s.
Usk	...	4.09	...	31.93	36.18
Virginia	...	...	...	23.97	31.07
Visa	...	7.56	1.41	32.24	n.s.
Woodlands	...	4.78	2.36	31.51	33.23
Zombi	...	1.72	2.82	26.36	35.67
Mrewa –					
Maryland	...	3.06	1.92	24.92	33.76
Mrewa	...	2.56	2.66	28.92	35.29
Nyaderi Mission	...	1.41	2.08	24.31	n.s.
Selous Nek	...	1.45	.64	19.88	33.73
Mtoko—					
Makaha	...	2.77	.29	22.00	31.85
Mtoko	...	2.42	1.38	25.91	28.02
Salisbury—					
Arcturus	...	3.17	4.15	33.59	37.10
Calgary	...	1.38	1.92	23.15	n s.
Chindamora Reserve	...	3.74	1.66	22.45	n.s.
Chinyika	...	...	...	21 29	n.s.
Glenara	...	2.40	.81	21.40	21.65
Goromonzi	...	2 18	2.45	28.55	38.42
Hatcliffe	...	1.68	2.52	24.76	33.69
Hillside (Bromley)	...	1.86	2.15	28 89	n.s.
Kilmuir	...	2.75	2.12	29.42	n.s.
Meadows	...	2 77	5.10	31 42	38.28
Pendennis	...	2.78	1.89	22.38	n.s.
Selby	...	5.36	2.15	26.00	30.73
Springs	...	2.80	3.48	23.79	n.s.
Teviotdale	...	1.53	2.58	22.64	n.s.
Vainona	...	1.48	3.11	23.64	33.47
ZONE E. :					
Belingwe—					
Belingwe (N.C.)	...	.39	nil	9.42	23.70
Doro	...	...	...	11 29	n.s.
Shabani	...	.47	.50	11.02	n.s.
Bikita—					
Angus Ranch	...	2.20	.92	14.90	24.27
Bikita	...	5.21	2.38	24.91	n.s.
Devuli Ranch	...	3.29	...	14.45	n.s.
Charter—					
Buhera	...	1.87	.78	28.10	35.21
Chibi—					
Chibi	...	.67	.48	14.52	23.68
Lundi	...	3.12	2.73	16.31	21.58

RAINFALL—(*Continued*).

Station.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Chilimanzi—				
Alanberry ...	2.01	.85	20.66	28.35
Driefontein ...	3.49	.43	19.34	27.67
Felixburg ...	3.19	.73	19.80	30.38
Grootfontein ...	2.54	...	18.81	29 29
Induna Farm ...	3.15	.73	17.83	31.93
Mtao Forest ...	3.06	.52	17.69	n.s.
Mukowries ...	3 21	.52	20.33	n.s.
Requeza Estate ...	2 33	...	17.63	n.s.
Thornhill ...	4.62	.33	18.95	n.s.
Gutu—				
Alheit Mission ...	3.19	...	15.35	23.51
Chindito ...	4.72	.57	21.91	31.96
Eastdale Estate ...	1.34	.40	21.15	32.07
Gutu ...	2.82	.70	20.50	30.45
Glenary ...	5.16	.25	25.37	26.13
Gwelo—				
Glencraig ...	1.79	.65	19.75	n.s.
Partridge Farm ...	2.91	...	21.36	35.81
Sheep Run Farm ...	1.37	...	19.13	30.00
Inyanga—				
St. Trias' Hill ...	8.45	2.34	31.25	38.67
Insiza—				
Roodeheuvel ...	1.03	.26	13.85	26.67
Makoni—				
Craigendoran ...	2.99	3.05	29.82	29.55
Forest Hill ...	5.57	1.75	26.24	31.20
Gorubi Springs ...	3.77	...	24.01	31.69
Inyagura ...	5.30	1.39	25.37	n.s.
Makoni Kop ...	4.69	.94	25.41	n.s.
Mande ...	...	...	...	...
Mona ...	6.10	.50	22.87	35.23
Monte Cassino ...	2.73	2.57	30.15	34.82
Romsley ...	3.01	1.89	31.73	n.s.
Ruati ...	4.44	...	28·39	n.s.
Rusape ...	5.58	nil	24.28	30.45
Tablelands ..	6.10	2.15	35.90	n.s.
Tsungwesi Ranch ...	...	...	...	...
Springs ...	4.14	.74	29.66	31.38
Whitgift ...	3.61	.44	23.66	n.s.
Marandellas—				
Bonongwe ...	3.25	2.10	25.87	32.43
Delta ...	2.62	1.30	20.11	32.13
Elandslaagte ...	3.83	1.71	23.84	n.s.
Marandellas Estate ...	2.11	2.11	21.80	32.34
Lendy Estates ...	...	...	20.53	34.64
Lushington ...	3.68	...	19.37	n.s.
Macheke ...	3.27	1.61	24.11	35.36
Marandellas ...	3.37	1 95	28.69	36.81
Nelson ...	1.78	...	24.52	28.43
Tweedjan ...	3.51	2.16	27.20	34.53
Wenimbi ...	5.39	1.26	28.54	n.s.

RAINFALL—*(Continued).*

Station.	1927. Mar.	1927. April.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(continued)				
Melsetter—				
Brackenbury ...	10.75	2.45	5.66	53.57
New Year's Gift ...	2.68	.59	19.62	n.s.
Ndanga—				
Doornfontein ...	2.98	1.09	19.46	26.35
Manjirenji ...	...	...	...	...
Marah Ranch ...	2.99	...	19.98	31.39
Zaka ...	2.91	1.61	21.36	39.57
Selukwe—				
Aberfoyle Ranch ...	2.15	...	15.60	31.41
Danga ...	...	...	...	...
Hillingdon ...	3.03	.77	24.36	31.63
Impali Source ...	1.17	...	17.12	n.s.
Rio ...	1.40	.65	20.56	29.63
Safago ...	.91	...	22.01	32.64
Selukwe Gaol ...	2.76	1.44	20.04	n.s.
Tokwe Block ...	...	...	14.14	n.s.
Woodlands ...	1.24	.16	19.32	n.s.
Umtali—				
Alicevale ...	8.77	2.15	31.54	31.47
Argyll ...	5.89	1.16	23.75	31.29
Embeza ...	6.72	4.68	49.15	n.s.
Fairview ...	6.23	...	26.78	n.s.
Fern Valley ...	2.95	2.33	25.08	n.s.
Jerain ...	4.88	1.01	18.65	32.07
Mutambara Mission ...	2.02	1.49	21.51	29.56
Odzani Power Station ...	7.12	1.36	32.36	37.26
Park Farm ...	5.71	1.69	31.81	n.s.
Premier Estate ..	4.40	2.23	24.47	30.70
Sarum ...	3.86	1.80	21.82	28.42
Stapleford ...	5.91	5.50	46.51	71.29
St. Augustine's Mission ...	5.94	2.00	39.13	n.s.
Transsau Estate ...	6.47	1.29	27.03	n.s.
Umtali Gaol ...	7.61	4.89	22.54	32.78
Victoria—				
Brucehame ...	2.11	.48	17.36	27.83
Cambria ...	2.10	.41	14.97	n.s.
Cheveden ...	3.95	1.66	25.89	n.s.
Clipsham ...	2.67	.57	13.44	28.40
Gokomere ...	4.14	.50	16.66	28.85
Mashaba ...	3.10	.79	19.55	n.s.
Miltonia ...	2.23	nil	14.88	n.s.
M'Sali ...	3.31	.84	16.68	n.s.
Riverdene North ...	1.99	.75	15.96	29.32
Salemore ...	2.62	1.07	19.64	n.s.
Silver Oaks ...	3.17	.93	19.35	28.45
Stanmore ...	2.01	...	14.52	n.s.
Victoria ...	1.88	.55	15.20	26.32
Zimbabwe ...	2.14	...	20.32	n.s.

RAINFALL—(*Continued*).

STATION.	1927. Mar.	1927. April	Total to end of period.	Normal rainfall to end of period.
ZONE F.:				
Melsetter—				
Chikore ...	4.90	3.09	31.01	40.24
Chipinga ...	6.27	1.34	29.70	41.66
Lettie Swan ...	3.43	1.94	29.22	n.s.
Melsetter ...	7.61	2.70	37.91	44.12
Mount Selinda ...	7.69	2.85	42.07	58.53
Springvale ...	...	...	...	...
Tom's Hope East ...	5.20	2.52	25.78	46.74
Vermont ...	...	4.71	42.75	60.33
Umtali—				
Chimeze ...	7.64	...	41.31	n.s.
Hoboken ...	...	...	...	...

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	...	...	112	...	...	884
March ...	135	1,837	...	2,375	...	...	84	...	...	4,431
April ...	106	2,574	...	1,440	...	...	28	...	...	4,148
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	June	July
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	11	9
Banket Junction	Banket Hotel	F. Potts	3	1
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	30	28
Bindura	Bindura Farmers' Hall	W. E. Fricker	11	9
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	1	6
Bubi	Queen's Mine	E. C. Gaudin	14	12
Chakari	Various farms	L. T. Tracey	16	21
Chatsworth	Makowries Farm	A. W. White	4	2
Daisyfield	Daisyfield (June), Somabula (July)	L. E. Edwards	18	9
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	11	9
Enterprise	Farmers' Hall	John Johnstone	6	4
Essexvale	Essexvale	C. Geneve	19	17
Felixburg—Gutu	Felixburg Farm (June), Chindito (July)	C. L. Burrows	11	9
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	7	5
Gadzema	Gadzema	G. M. Leahy	12	10
Gatooma	Speck's Hotel	C. M. Davenport	18	16
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	6	4
Greystone	Quarrie Farm	P. J. van der Walt	...	9
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	9	14
Inyazura	Inyazura	Major Tulloch	3	1
Lalapansi	Lalapansi	Edmund Chapman	11	9
Lomagundi	Sinoia	F. W. Robertson	...	8
Lomagundi West	Various farms	E. Morton	12	10
Macheke	Macheke	M. J. Palmer	...	9
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	5	3
Makwiro	Makwiro	F. H. Howard	17	15
Makoni	Rusape	—. Munch	11	9

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	3	1
Marandellas, Southern	Various farms	D. J. Gale	1	6
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	10	8
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A. Carnegie	9	14
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	18	16
Mazoe (Concession)	Concession Hotel	Frank Allen	14	12
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	8	13
Melsetter	Court House, Melsetter	Dr. Rose	9	14
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	8	13
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	25	30
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	3	1
Nyamandhlovu	Nyamandhlovu	E. H. T. Mitchell	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	4	2
Poorte Valley	Various places	D. Wilson	18	16
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	18	16
Salisbury South	Various farms	P. Linton	29	27
Selukwe	The Hotel, Selukwe	W. T. Simpson	3	1
Shamva	Shamva Hotel	E. Butler	16	21
Two Rivers Farming Association	Various farms	W. L. Parsons	11	9
Umboe (Branch of Lomagundi F.A.)	Various farms—Farm Zebra Vlei (June)	A. J. Hawkes	11	...
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	11	16
Umtali	Drill Hall, Umtali	A. Howat	2	7
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	10	8
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	8	13
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

COTTON.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

CROPS.

Selection of seed maize, combined with harvesting of the earlier planted areas, will be the principal occupation during this month. Care must be taken not to shell until the grain is quite dry. Stooked maize after the removal of the ears should be carried and stacked. Beans, such as velvet and dolichos, will be threshed and the straw and pods saved for feed. Pumpkin seed will be selected from the best specimens, and potatoes which have been raised should be stored in a cool, shady place.

Ploughing will become more difficult and less efficacious as the soil gets drier, but should be pushed on with in preparation for next year's crops. Where possible, harrows should at once follow the plough to break down the clods and conserve moisture.

Winter wheat, oats or barley will require but little attention. Late sown onions can be transplanted to their permanent situations.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary,

therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful. During the winter months it is usually quite possible to keep the evening's milk in a comparatively fresh and sweet condition. This is best achieved by placing the milk outside the dairy overnight and exposing it to the atmosphere. The milk should preferably be placed in a bath and covered over with cheese cloth, butter muslin or mosquito gauze netting.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots.

Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood.

Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month.

Cultivation should be continued.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective.

Thinnings where necessary may be continued, and fellings which are to be made are to be carried out.

Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar.

The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed.

A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop. Iron houses without a good thick layer of grass on the top and round the sides will be very cold at night for the birds, and not only will the egg output drop, but the birds will very likely contract congestion of the lungs, bronchitis or pneumonia.

Cold weather, too, is likely to affect the breeding stock and cause infertile eggs. A little extra crushed mealies added to the evening feed

on cold days, or a little barley softened with hot water, will keep up the body heat of the birds.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—Where it is necessary to move cattle to fresh pasturage, this should not be unduly delayed. Dipping is best postponed during very cold snaps until a warm day occurs. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night. and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—Sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

TOBACCO.

The grading of tobacco should be proceeded with. Any bales being stored on the farm should be turned occasionally, especially where more than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Melsetter District.
22.4.27.	Government Notice No. 216 reduces the area of infection to two farms, viz., Lombard's Rust and all sub-divisions thereof and Kronstad.
	Umtali Native District.
22.4.27.	Government Notice No. 219 releases the farm Gwendingwe from the area of infection and reduces the guard area.
	Umzingwane, Insiza, Matobo, Gwanda and Bubi Native Districts.
22.4.27.	Government Notice No. 220 adds to the farms declared to be areas of infection and amends the guard areas to suit the circumstances.
	"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."
22.4.27.	Government Notice No. 218 prohibits the removal of hides and skins or any portion of the carcase of any animal from the Ntabezinduna Reserve and Battlefield Block, Bubi district, unless under the written permission of an inspector or sub-inspector.
	AFRICAN COAST FEVER.
	Bulawayo, Nyamandhlovu and Bulalima-Mangwe Native Districts.
13.5.27.	Government Notice No. 248 provides for the inclusion of the farm Beckenham in the area of infection in the Bulawayo native district and amends the guard area.
13.5.27.	Government Notice No. 249 provides for dipping in the areas of infection and guard areas at such intervals as the Controller of Stock and Chief Inspector consider expedient.
	Charter Native District.
13.5.27.	Government Notice No. 250 declares the farms Wildebeestlaagte and Harteheestlaagte areas of infection and proclaims a guard area.
	Umzingwane, Insiza, Matobo and Gwanda Native Districts.
13.5.27.	Government Notice No. 251 declares an area for the purpose of erecting fences and dipping tanks.

Departmental Bulletins.

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Maize Grading Regulations.

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No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
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No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
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No. 524. The Use of an Aneroid Barometer, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 532. The Short Period Forecast and Daily Weather Report, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 542. Review of the Abnormal Rainfall Season 1924-25, by C. L. Robertson, B.Sc., A.M.I.C.E.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.

No. 226. Classification of Clouds, by R. H. Scott, F.R.S.

No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C.

No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.

No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.

No. 283. Maize Foods for the Home.

No. 358. Notes on the Regulations Governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.

No. 414. Limestones in Southern Rhodesia, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

No. 479. Quinine Prophylaxis in Malaria, by A. M. Fleming, M.B., C.M., F.R.C.S.E., D.P.H.

No. 487. The Quarrying of Granite for Building Purposes, by G. M. Gillèspie.

No. 518. Locusts as Food for Stock, by Rupert W. Jack, F.E.S.
No. 549. Ochna Pulchra Berries, by A. W. Facer, B.A., A.I C.
No. 554. Pisé-de-Terre, by P. B. Aird.
No. 569. Education of Children of Farmers in Southern Rhodesia, by R. McIntosh, M.A
No. 574. Brick-making on the Farm, by A. C. Jennings, Assoc M Inst.C.E., A.M I.E.E
No. 588. Concrete on the Farm, by N. P. Sellick, M.C., B Sc. (Eng.), Assistant Irrigation Engineer
No. 609. Protection from Lightning, by Lieut.-Col. Judson

The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers
Farming Returns for Income Tax Purposes
Land Bank Act (price 1/-).
Twelve Simple Rules for the Avoidance of Malaria and Blackwater

Tea growing experiments at New Year's Gift, Chipinga (Messrs. Ward and Phillips). Corner of first planted tea, 12 ft. x 12 ft. Seed planted February, 1924. Transplanted February, 1925. First two rows pruned June, 1926. (See text.)

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.

Tea Culture in Southern Rhodesia.

In 1924 Messrs. Ward & Phillips, of New Year's Gift, Chipinga, imported some tea seed of the best kind obtainable from India. Owing to delays in transit much of the seed was infertile on arrival, but about 200 plants were reared and planted out in February, 1925, to form a source of future seed. These have made excellent growth, and many of them are now, at 2¼ years after planting out, over 6 feet high. This is fully equal to the results obtained in the most favoured tea districts in India. In June, 1926, eighteen of these bushes were pruned as is customary for leaf production.

The growth has been very satisfactory, and the small quantity of leaf produced at this early stage was manufactured under very rough and ready conditions, over a kitchen stove. Nevertheless a sample of the tea so manufactured was reported on by Messrs. Thomas & Co., tea brokers, of Calcutta. Their report was favourable, and they stated that the tea was equal to the average of that produced in Assam.

In February, 1926, a further consignment of 400 lbs. of tea seed was imported, of which 50 per cent. was infertile on arrival. The delay this time was due to the shippers landing the seed at Mombasa instead of Beira. However, very good nurseries were produced, from which eight acres of tea have been planted out 4 feet by 4 feet. This promises to make a first-class section of tea.

This year another 500 lbs. of seed was imported, but owing to grievous delays, chiefly in Beira, the seed had all fermented, and it is very unlikely that a single plant will be obtained. The seed was six months in transit. This represents a loss of £90 to the importers this year on seed alone. Some of the first planted bushes are now in flower, and it is hoped will produce some acclimatised seed next year. It is intended to send seed over by parcel post at the end of this year.

The type of seed imported has been Dooliaguri, variety Manipuri.

Dipping of Cattle.—Attention is directed to Government Notice No. 278 printed at the end of this issue of the Journal, which prescribes that all owners of cattle who do not possess dipping tanks must keep a record in the form of a schedule of the number of cattle owned and the date on which they were dipped. This schedule has to bear the signature of the person in charge of dipping, and it must be produced by the owner for inspection when required by a duly appointed official of the Government.

Branding of Cattle.—It frequently happens that settlers and other new arrivals in the Colony desiring to register a cattle brand are directed to the office of the Registrar of

Tea at New Year's Gift, Chipinga. Section planted 4 ft. x 4 ft. with one-year-old seedlings, April, 1927.

Tea at New Year's Gift, Chipinga. H. and C. cultivators at work.

Brands in Salisbury. Much time and travelling may be saved if it were generally known that the Magistrate (or Assistant Magistrate) of each district is a Deputy Registrar of Brands.

Branding of breeding cattle is not compulsory, but in the interests of the owner it is advisable to brand in order to establish ownership in the event of cattle straying and being impounded. Working oxen on public roads must be branded.

In January last the branding regulations were amended to permit of an owner branding his cattle anywhere on the near side with the exception of the hoof. Second or subsequent brands may not be imprinted on top of an old brand, but at a distance of not less than one-and-a-half inches from and directly underneath it.

Maize for Export.—With the advent of the maize export season the attention of farmers and others concerned is directed to the amended maize export regulations which were published in the issue of this Journal for June, 1926. These regulations are also available in bulletin form, and may be obtained upon application to the Department of Agriculture.

The attention of farmers is also directed to an article entitled "Maize for Export" which appeared in the issue of this Journal for July, 1926, wherein are given suggestions framed for the purpose of assisting farmers to deliver their maize at a siding in such a condition that it will be passed for export with as little loss or delay to themselves as possible. One of the most common causes of rejection is the insecure sewing of the sack. After his maize has been delivered at a siding, the farmer should personally inspect the sacks and have those re-sewn which show any signs of loose sewing. It should be remembered that maize for export must be contained in new bags, and that the bag must be sewn without lugs. The article to which we have referred describes in detail how the bags should be sewn.

According to the estimate of the Statistician, the maize crop this year is expected to yield 1,450,000 bags from 275,000 acres. The crop harvested in the previous season amounted to 1,393,654 bags from 239,662 acres.

Boring Operations.—A considerable increase in the extent of the boring operations has recently taken place owing chiefly to the necessity for providing permanent water supplies in certain of the areas of unalienated land which are now being made available for European settlement. In addition, however, there has been a steady increase in the number of applications received from the older established farmers for the hire of the Government drilling machines. At the commencement of 1926 there were only three Government drills in operation in this Colony, two of which were wholly employed in the development of water supplies in the native reserves. During 1926 the number of drills in operation was increased to six, which were engaged in Gwanda, Hartley, Salisbury, Mazoe and Lomagundi districts. The footage drilled during each working month per drill was 124 feet at an average cost to private applicants of 19s. 6d. per foot, including the casing supplied, the maximum cost for an individual borehole being 41s. 6d. per foot, and the minimum cost being 12s. 4d. per foot. These low drilling costs are due to the combined percussion and rotary machine which has been specially designed for the difficult drilling formations experienced in this country. In all 43 boreholes were sunk, of which 65 per cent. yielded good supplies, the aggregate yield of successful boreholes being 417,800 gallons per 24 hours. For private applicants 24 boreholes were sunk, which represents more than half of the total footage drilled.

During the present year it is intended to have ten drills in operation. Excluding the two engaged in the native reserves, these drills will be employed in Gwelo, Gwanda, Bulawayo, Nyamandhlovu, Hartley, Lomagundi and Mazoe districts. Two of these drills will be exclusively employed on drilling for private applicants, one in Matabeleland and one in Mashonaland, whilst the others will be available as opportunity offers on completion of the present programme of work.

As there is a considerable demand for the services of these drills, they are booked up for some time ahead, but farmers are advised to put in their applications early in order that provision may be made to meet their requirements in due course. The regulations governing the hire of these drills and forms of application are obtainable from the Irrigation Branch of the Department of Agriculture.

Tea at New Year's Gift. Tall bush on left three years three months from seed. Nursery bed on right with one-year-old seedlings.

Tea at New Year's Gift, Chipinga. H. and C. cultivators at work.

The Dairy Industry.—If reference is made to the article by the Statistician in our last issue, it will be seen that notwithstanding the regrettable decrease in the number of European-owned cattle in the Colony, the dairy industry had its record year in 1926, and every branch of dairying showed a marked increase in production.

Owing to the slump in the prices paid for slaughter stock during the past few years, the attention of the Rhodesian farmer has been attracted more and more to the profits which can be derived from dairying. The same feature is worldwide. The Argentine, for instance, is rapidly turning its attention to dairying and is supplying the overseas market with butter of excellent quality. This applies equally to Australia, where what was ranching country a few years ago is becoming more closely settled and changed into flourishing small holdings on which dairying is practised with excellent results.

As instancing the progress which has been made, it may be noted that the production of butter shows a very marked increase, notwithstanding the long drought from March to December, and totalled the satisfactory figure of over 800 tons, or roughly 40 lbs. per head of white population. Cheese also, although there was a slump in prices in the Union of South Africa, which, of course, affected the price here, shows an increase of production from 130,000 lbs. to 150,000 lbs. The quantity of milk produced was 1,232,170 gallons, which would appear to indicate that the value of fresh milk in the home is being more appreciated.

The value of the dairy industry and its allied pig-raising industry is of very considerable importance to the Colony, and these two industries cannot any longer be regarded as mere side lines. In round figures their value may roughly be estimated as follows:—

1,232,000 gallons of milk at 1s. 6d. per gall. ...	£92,400
1,600,000 lbs. of butter at 1s. 6d. per lb.	120,000
153,000 lbs. of cheese at 1s. 3d. per lb.	9,500
619,000 lbs. of bacon at 1s. 3d. per lb.	38,690
	£260,590

The value of the young stock raised is, of course, omitted, but should it be included we may estimate the value

of the dairy and pig industries to be very considerably in advance of the above quoted figure.

Eradication of African Coast Fever.—Our readers will have noted the efforts which the Government is making to eradicate African Coast Fever from the Colony. The special congress of the Rhodesia Agricultural Union held recently passed a resolution requesting the Minister of Agriculture and Lands to make a special effort to eradicate the disease by 1st January, 1929, and this resolution was accepted by the Minister, who undertook to make every effort to have the Colony declared "clean" by the date mentioned. The main line of attack consists in eliminating the tick, and with this object in view every stock owner in the Colony is being urged to dip his cattle systematically in a fluid of regulation strength. The great majority of cattle owners do this, but unfortunately there is a small minority who are lax in their method of dipping, and herein lies the danger. Dipping at regular intervals is compulsory by law, but it is obvious that in a sparsely populated country such as this it is impossible for the officials of the Veterinary Department to see that the regulations are complied with in every instance. The Government is and must be dependent on the willingness of the stock owner to comply with the regulations, and without whole-hearted co-operation with the Government in this matter there is little hope of eradicating the disease which is seriously retarding the progress of the cattle industry.

Efforts are therefore being concentrated on getting the cattle owner to dip his cattle effectively, and with this object in view a series of articles is appearing in different issues of this Journal. Last month we published one by the Director of Veterinary Research, which gave the life cycle of the harmful tick and showed how dipping conscientiously practised will eradicate the carrier. This article was reprinted in bulletin form, and a copy sent to every cattle owner in the Colony. In this issue appears a further article dealing with the same subject, and we commend this to the careful perusal of those concerned.

A Bill is now before the Legislative Assembly having for its object the consolidation of existing Ordinances dealing

with the cleansing of cattle, while it tightens up the present regulations in this respect.

Provision is also being made to enable farmers who are already bonded to the Land Bank to borrow additional sums for the purpose of building dipping tanks and to provide more fencing. In addition to that, instructions have been given to the Lands Department that in areas where farms are being settled, provision should be made by the erection of dipping tanks on one or more of the farms in the district, so that none of the owners will be under the obligation to go more than five miles to have the cattle dipped.

In this way effect is being given to the resolution referred to, and we earnestly hope that by the date prescribed the Colony will be declared free of this dread disease.

Rhodesian Oranges for India.—We have referred in previous issues of this Journal to the efforts of the Rhodesian Co-operative Fruit Growers' Association, Ltd., to establish a market for Rhodesian oranges in India, and we now learn that portion of a consignment of 241 cases of Navel oranges which were shipped from Beira on 29th April per S.S. Khandalla has been sold in Bombay for an average price of 23s. per case. This would leave a balance to the grower of about 12s. 6d. per case f.o.r., any station in Rhodesia. A further shipment of 100 cases was due to leave Beira for Bombay by the same boat on the 24th June.

The *Times of India* of 19th May contains an article bearing the captions "Oranges from Rhodesia," "Bid for Indian Market," in the course of which reference is made to the special medal and certificate awarded citrus fruit from Rhodesia at the Poona Agricultural Show last year and to the consignments going forward this season. It is stated that it has not been possible to distribute the fruit in the interior of India owing to lack of suitable ventilated railway trucks and also on account of prohibitive railway rates over the long distances involved. Direct shipment to any other port than Bombay appears to be impossible owing to the lack of cold storage accommodation at the destination or to the absence of suitably fitted steamers plying.

The Rhodesian Co-operative Fruit Growers' Association, Ltd., has not confined its attention to India, but is exploiting the markets of Egypt and southern Europe, where Rhodesian citrus fruits can be landed at a time when there is none forthcoming from local sources. It is quite possible that at this season of the year Rhodesian fruit may command good prices, and the results will be awaited with interest. The enterprise of the Association in endeavouring to create markets in countries easily accessible to our own is highly commendable, and we hope that their efforts will meet with success. At the same time we feel that a vigorous and well sustained campaign in Rhodesia "to eat more oranges" would probably produce justifiable results and solve the problem of the disposal of fruit not quite up to export standard, but suitable in every way for local consumption. To be successful the fruit must be easily obtainable and sold at a moderate price. There is no more satisfying thirst quencher than orangeade, which is easily made and is an excellent substitute for green vegetables by reason of its vitamine content.

Some idea of the efforts being made in Britain to increase the consumption of fruit can be gleaned from the second report of the Fruit Traders' Federations on National Advertising (London, England), recently issued. The report states:—The second "Eat More Fruit" advertising campaign has run its course and has been a success from every point of view. Good as were the results of the first year, the cumulative effect of consistent propaganda, reinforced with new ideas, has more than justified the expectations of the most optimistic of its supporters. Great Britain is eating more and more fruit. The dietetic value of fruit is at last realised by the public. From being but a kind of occasional luxury purchase, fruit is taking its place in the dietary of the nation.

The basic idea of the whole campaign, which was to cultivate further amongst the public the habit of eating more fruit, remained the same last year as in the initial effort. In the first year, the slogan of the campaign, "Eat More Fruit," was deeply impressed upon the minds of the public, and it would be no exaggeration to claim that, last year, fruit was indeed given its rightful place in the nation's habits. First the idea of eating more fruit, then the reasons for

Tea at New Year's Gift, Chipinga. One of the best bushes, 7 feet high. Three years and three months from seed.

Tea at New Year's Gift. Box of seedlings lifted from nursery.

eating it—that was the plan, and brighter, cleaner retailers' shops did the rest.

Publicity methods introduced during the past season have been varied and ingenious. Every available opportunity for advocating the fruit habit has been seized. For instance, there was the "Eat More Fruit" song. Played and broadcast by the most popular band in the country, the whole nation sang it, whistled it, and danced to it.

Tobacco.—A recent issue of the "Western Tobacco Journal" contains an interesting report issued by the United States Bureau of Foreign and Domestic Commerce bearing the title "Tobacco Expansion of British Colonies as Reflected by the Trade." It is stated:—"The encroachment of British colonial tobacco leaf upon the trade of the United States and other countries shows up for the first time in the British import trade for 1926. The effect of course is more marked on the United States trade, since the United Kingdom normally obtains practically 90 per cent. of her leaf tobacco supply from this country. Imports into the United Kingdom in 1926 amounted to 197,509,815 pounds, an increase of 4.5 per cent. over the total quantity imported in 1925; colonial imports amounted to 29,994,292 pounds (according to an unofficial report), and mark an increase of 60.9 per cent.; while imports from the United States amounted to 161,659,317 pounds, a decrease of 0.7 of 1 per cent. Due probably to the fact that the darks find greater soil and climatic affinity in British India and Canada, these types have been penalised more heavily in the trade than the flue-cured or cigarette tobaccos. The official trade reports of the United States show a decline of 29 per cent. in the United Kingdom trade of dark fired Kentucky and Tennessee in 1926, 26 per cent. in the trade of dark Virginia, and a decline of 4 per cent. in the trade of flue-cured."

The statement is also made that the effect of Colonial expansion on British consumption cannot be estimated just yet. Colonial tobaccos are new and it is asserted that many British factories are using them sparingly. The opinion is expressed that there is probably no country in the world with

a smoking taste so set for American tobaccos as England, and it is regarded as questionable whether the British smoker is going to change suddenly to colonial tobaccos. The following remarks have a particular significance for the tobacco grower in this Colony:—"The ultimate and real test will be found in the degree of substantial quality which can be attained in colonial tobaccos, and considering the capricious behaviour of the weed under various environments, this is a most uncertain factor."

An analysis of the imports of Colonial tobacco into Great Britain in 1926 is given, from which it is seen that between 85 and 90 per cent. of the supplies came from British India, Nyasaland and Canada. Rhodesia is credited with sending 2,323,322 lbs. of tobacco, but the total evidently includes the export from Northern Rhodesia as well, for according to the Customs returns we sent 1,417,349 lbs. of unmanufactured tobacco to Great Britain in 1926. Our total exports for that year amounted to 4,287,833 lbs., of which 2,629,268 lbs. went to the Union of South Africa.

Referring to the recent tariff increase on tobaccos entering Great Britain, it is stated in the report that one of the inevitable results will be the substitution of cheap tobaccos by manufacturers in order to make a product within the demand of everybody.

The tobacco tariff is, of course, based on the moisture content of the leaf, and the effect of the recent revision is that unstripped tobacco containing 10 per cent. or more moisture now has to pay 8s. 10d. per lb. against 8s. 2d. previously. Unstripped tobacco containing less than 10 per cent. of moisture has to pay 9s. 9½d. against 9s. 0½d. formerly. Empire tobacco unstripped containing 10 per cent. or more moisture is taxed 6s. 9½d. per lb. against 6s. 1½d. per lb. under the old tariff, and unstripped tobacco containing less than 10 per cent. of moisture 7s. 6⅜d. against 6s. 9⅜d. previously.

We observe from the monthly report issued by Messrs. Frank Watson and Co., Ltd., of London and Liverpool, that in May bright Virginia tobacco, good to fine, was quoted at 30d. to 40d., and medium 19d. to 28d. per lb.

Some figures of the estimated production of tobacco in 1926 in the northern hemisphere, taken from the International Crop Report, published in Rome, may be of interest. They are as follows:—Belgium, 12,187,000 lbs.; Bulgaria, 52,911,000 lbs.; France, 25,228,000 lbs.; Greece, 115,743,000 lbs.; Italy, 97,886,000 lbs.; Czechoslovakia, 16,654,000 lbs.; United States of America, 1,323,388,000 lbs.; Japan, 143,427,000 lbs.; Algeria, 27,183,000 lbs.

Show Dates.

Bindura Tobacco and Cotton Show, 16th July.

Bulawayo Agricultural Society, Bulawayo, 26th, 27th and 28th July.

Midlands Agricultural Society, Gwelo, 4th and 5th August.

Rhodesian Agricultural and Horticultural Society, Salisbury, 17th and 18th August.

The Care of Tobacco Seed Beds.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad), Government Mycologist.

There does not appear to be a general realisation in this Colony of the vital importance to tobacco culture of the proper treatment of seed beds in order to raise strongly growing, disease-free seedlings for transplanting into the lands. It cannot be too often reiterated that the secret of producing a clean crop lies in the care and attention paid to the plants in their early stages of growth.

In order to acquaint farmers with the dangers which may be encountered by those who neglect even the smallest and what may appear to be unnecessary details in the management of their seed beds, it will be as well, first of all, to give a brief summary of diseases to which young tobacco plants are susceptible, and which, if transferred to the lands, may be the cause of very severe and, in some cases, almost total loss of the crop.

Undoubtedly the most serious diseases which have to be faced in Southern Rhodesia are white mould, wildfire and angular spot. The first of these does not appear in any way to be connected with the early stages of the growth of the plant, but original infection by wildfire and angular spot can in nearly all cases be traced to the seed beds. They may either be brought in on the seed or on old tobacco refuse. The organisms responsible for the disease may be harboured in the soil, if the site has not been changed, in old cheese cloth, in the bricks surrounding the beds, or can be introduced by insects. Numerous other sources of contamination have been demonstrated, and the whole subject will be dealt with later.

Although wildfire and angular spot are the two most dreaded bacterial diseases in this Colony, yet there are other

affections produced by similar organisms which may make their appearance in any year, especially as the acreage under tobacco increases. One of these diseases, the Wisconsin leaf spot, is similar to wildfire, but apparently is not as virulent, and it is possible that it is already in the country. But of far greater importance is the root disease known as Granville wilt, due to a germ called *Bacterium solanacearum*, having a very large range of hosts which it can infect. It is apparently capable of living in the soil for four or five years, and can cause heavy loss if tobacco is planted in an infected field. It is highly probable that the original source of infection lies in the seed bed and the organism is transplanted with the seedling into the lands. A similar germ causes the hollow stalk disease, and has been reported from two districts in this Colony.

There is a large number of diseases caused by a variety of fungi, but only those capable of causing damage in seed beds, or which may originate from this source, need be described. The most commonly talked of disease and probably that about which least is known is "damping off." This condition is usually attributed to an excess of moisture in the soil and atmosphere. Humidity is undoubtedly a contributing factor in the killing off of young plants, but the real cause invariably lies in one of several organisms. It is of utmost importance that this point should be fully grasped. "Damping off" may be caused by the wildfire germ, *Bacterium tabacum*. It may be caused by either of the fungi *Rhizoctonia solàni* or *Pythium debaryanum*, whilst species of *Fusarium* and *Phoma* have been reported from the South African Union in this connection.

The writer has isolated species of the two fungi *Fusarium* and *Macrosporium* from roots of diseased seedlings in the plant beds, and experiments have shown that these organisms are capable of producing a damping off under laboratory conditions.

One other pest is worthy of special note, because it appears to be well distributed throughout the country, and unless strict measures are taken for its control it may well become one of the most serious menaces to tobacco growing in Rhodesia. The organism referred to is the Nematode or eelworm, *Heterodera radicicola*. Nematode may be intro-

duced to the lands in various ways, the most common being on the roots of seedlings. The pest is catholic in its tastes and infests a large variety of plants, and as the only method of control known is by rotation of crops, it is obvious that much difficulty is experienced in its eradication.

Although of a different nature from the diseases so far mentioned, mosaic of tobacco takes a prominent place amongst the most serious diseases to be encountered here. There is much controversy as to the cause of mosaic, and little is known of the way in which it tides over from one crop to another. That it is infectious is easily proved by merely bruising a healthy plant with hands contaminated with infected juice. In a short while typical symptoms of the disease appear upon the young leaves, and the virus may easily be spread throughout a field by similar means. It is a common belief that mosaic does not appear in the seed beds, but is caused by faulty transplanting of the seedling. The writer has observed diseased plants in seed beds on numerous occasions, but the symptoms are so indistinct that only a trained observer would see them. The infected plants coming in contact with the healthy transmit the disease; similarly healthy seedlings become infected from the hands of labourers during the planting out operations, and it is a common sight to see lines of mosaic plants bordered by rows of healthy individuals, the disease having originated from probably one infected seedling in a *machila*. This being the case, it should be the duty of every farmer to look for diseased seedlings in the plant beds and to remove them before they produce widespread infection in the lands.

A fungus which has caused considerable consternation amongst growers is what is known as pink mould (*Pyronema confluens*). Pink jelly-like masses, which are the fruit bodies of the fungus, appear upon the ground and occasionally seem to smother young seedlings. This organism has never been recorded as a parasite, but feeds upon non-living matter, its favourite habitat being burnt ground or charred wood. It is commonly seen after grass fires which have been followed by a period of wet weather. The presence of pink mould is often put forward as an argument against the burning of seed beds, but there is no evidence to show that any

damage is caused by the fungus; in fact it is merely an indication that too damp conditions exist.

One further disease of a serious nature, and which fortunately has not yet made its appearance on tobacco in this country, is black root rot, due to a fungus, *Thielavia basicola.* As a rule, original infection takes place in the seed bed and lands are infected by the usual method of the fungus being transplanted on the roots of seedlings.

Practically all the important diseases of tobacco which may come from seed beds have now been mentioned, and it can be seen that unless due precautions are taken the chances of a farmer raising a perfectly clean crop are small. This is probably the experience of the majority of growers in Rhodesia.

In subsequent articles the above diseases will be described in detail and methods of control advocated, which, if carried out conscientiously and efficiently, should guarantee to the farmer a large amount of immunity for his crops from the affections which are a constant source of worry and loss to him.

(*To be continued.*)

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, 1925-26.

(Concluded.)

By H. C. Arnold, Manager.

Potato Varieties.—These experiments commenced in 1921-22, and have been continued each year. The crop is grown in the summer only, so the seed has to be kept over from season to season. Improved methods of keeping the seed resulted in better stands among the mid-season varieties than had been obtained for some years, but in two or three instances very low yields of these have to be reported, which indicates that these varieties tend to degenerate after having been grown but a few years in this country. It is found that, as a general rule, the kinds which mature quickly and are usually known as "early" or "mid-season" varieties degenerate sooner than the main crop and late sorts. Arran Rose, Dargill Early, Epicure, Early Rose and Bloomfield were excluded from our trials last year, after repeatedly yielding indifferently over a period of three or four years. This season's trials show that Arran Comrade, King George, Great Scot, Tinwald Perfection and Lochar cannot be included in our best six varieties, so they will be discarded.

The Up-to-date variety has consistently proved itself a good yielder, and so far is rivalled only by Majestic and King's Perfection. Although the King Edward potato gives light yields, it is generally recognised as the best "cooker." It holds the premier place on the English market at the present time, because of its ability to withstand so much abuse in the hands of those who possess but an imperfect knowledge of cookery.

Variety Trials: Yield per Acre in Bags of 150 *Lbs.*

Variety	1925-1926	1924-1925	1923-1924	1922-1923	1921-1922	Average yield	Number of seasons under trial
Up-to-date	80	123	50	...	...	84	3
King's Perfection ...	95	111	...	...	...	103	2
Majestic	89	117	38	100	53	79	5
White City	74	79	45	74	...	68	4
Kerr's Pink	58	76	34	120	36	65	5
Tinwald Perfection ...	61	65	38	107	43	63	5
King George	47	101	25	75	40	58	5
Great Scott	35	89	34	59	63	56	5
Arran Comrade	38	54	33	45	46	43	5
King Edward	35	58	30	...	...	41	3
Lord Roberts	...	...	...	...	...	...	...
Up-to-date	92	...	...	...	...	...	1

Green Manure for Potatoes.—To obtain large crops of saleable tubers, it is usually found that heavy dressings of kraal manure and artificial fertilisers are required. Under Rhodesian conditions, the supply of kraal manure is often very limited, and in order to investigate the possibility of utilising green manure crops for supplementing the kraal manure, these trials have been commenced. Crops of velvet beans and Sunn hemp were ploughed under last season, and on a third plot oats and cowpeas were grown and reaped for hay. The whole area was dressed with kraal manure at the rate of six tons per acre and 200 lbs. of bone and super was applied, with results as follows:—

Treatment.	Yield per acre
Velvet bean, whole crop ploughed under	93.7 bags
Sunn hemp, whole crop ploughed under	87.7 bags
Oats and cowpeas, stubble only ploughed under	77.8 bags

It appears therefore that an average increase of 13 bags per acre, or nearly 17 per cent., resulted from ploughing under the green manure crops.

Sweet Potatoes.—For the past five years a number of varieties of these have been grown on the experimental plots. They have been gathered from several different sources, and occasionally a variety which has been under trial for a number of years is received from another place under a new name. Thus, Early Butter was obtained from Natal in 1920, and three years later the New Zealand variety was received from Capetown. After a thorough test over a period of three years, we have decided that they are both the same variety, and that Early Butter is the more suitable name for it. Common White and Native will be excluded from further trials by reason of the poor yields which they invariably give. The variety called Glenara has yielded some very heavy crops of vines, but its yield of tubers is very low for the first year after planting, and there are indications that it requires a considerably longer period for its tubers to develop than those varieties which yield heavily the first season. It is advisable to plant cuttings of sweet potatoes as early in the season as possible, for they require several months to mature; when sufficient rain falls to allow the cuttings to take root in November or early December, good crops of tubers can be lifted about six months later, but if planting has to be delayed until January or February, the yield of tubers will be much lighter the first season, and in such cases it is usually found more profitable to delay lifting them for another year.

Variety Trials: Yields in Lbs. per Acre.

Variety.	Average yield of tubers.	Average yield of green tops.
Over four years—		
Common Pink	18,625	12,134
Early Butter	17,824	16,361
Calabash Leaf	14,400	19,847
Red Nancemond	12,229	17,146
Common White	10,647	16,752
Over three years—		
New Zealand	15,150	13,034
Over two years—		
Early Red	13,734	8,923
Glenara	8,308	28,860
Native	5,416	18,510
Over one year—		
Linslade	16,215	25,344
Oklahoma	9,936	19,968

Excepting when the work is very thoroughly performed, a plentiful crop of volunteer sprouts follow the first and subsequent crops of sweet potatoes. When the climatic conditions are favourable for the first crop, the heaviest yields are usually obtained from it, but moderately good yields are also obtained from the second crop. Frequently, however, the volunteer sprouts are much too plentiful, and unless the precaution is taken to reduce their numbers, a large proportion of the tubers will be under-sized and therefore valueless. The following table shows how the yields of the second season's crop compare with those of the first season, and our variety trials for the past two seasons.

Yields of Tubers in Lbs. per Acre.

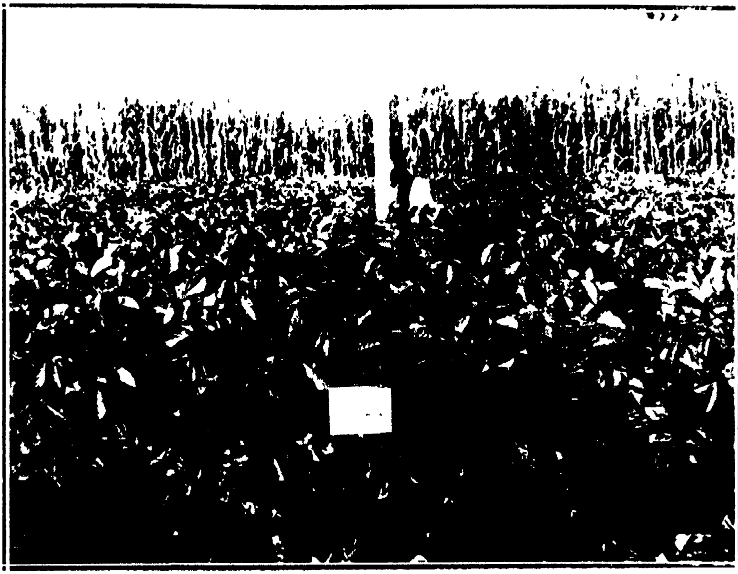
Name of variety.	1924-25 (1st season).	1925-26 (2nd season).
Common Pink	20,240	14,166
Early Butter	23,620	16,488
Calabash Leaf	15,300	4,392
Red Nancemond	16,520	6,228
Common White	14,640	4,734
New Zealand	19,160	16,692
Early Red	19,060	14,004
Glenara	4,420	5,238
Native	7,560	6,318

The heaviest yields of sweet potatoes are obtained when the climatic conditions favourable for their growth continue over a period of several months. Therefore, in areas in which the rains are liable to be late in commencing, it is often not possible to set the sweet potato slips out sufficiently early to secure a good return of tubers the same season. Under such conditions, planting the slips under the maize crop in January or February with the intention of lifting the tubers fifteen to eighteen months later has been recommended. Trials conducted here last year showed that the small growth made by the sweet potatoes during the first season prior to the advent of frost did not reduce the yields of maize, so there is no objection to the practice on that account.

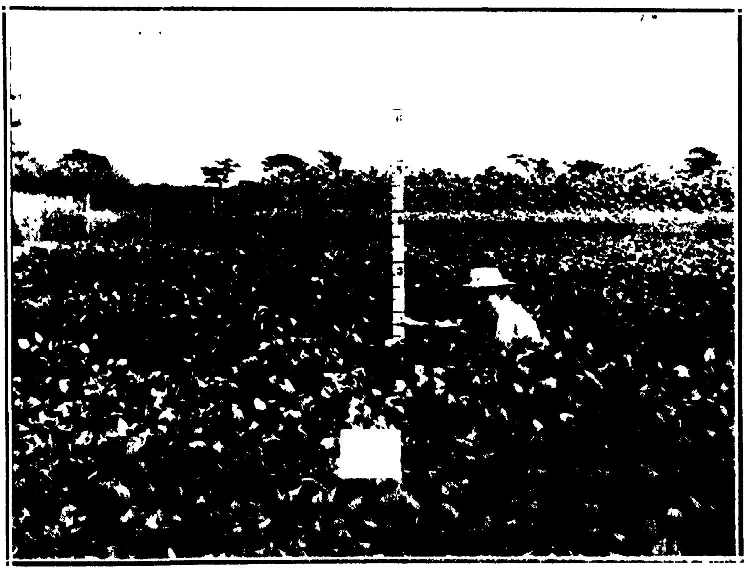
Trials made here this year on duplicate plots show that while the crop of vines was practically the same in both cases, the yield of tubers from the February planting was three times as heavy as that of the slips planted in the following December.

Average Yield of Two Plots.

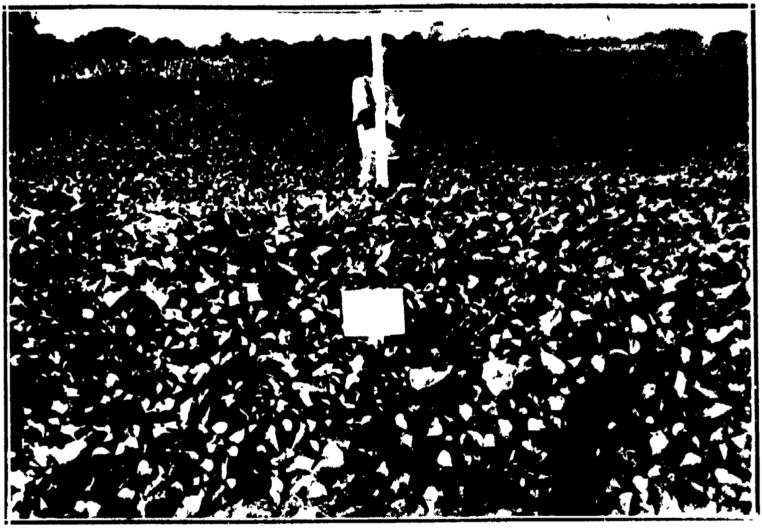
	Tubers. Lbs. per acre.	Vines. Lbs. per acre.
Slips planted under maize, 4th Feb., 1925	23,520	17,103
Slips planted 21st Dec., 1925	7,572	17,504



The White Jack bean, *Canavallia* sp. This bean has given promising results as a green manure crop. Agricultural Experiment Station, Salisbury.



Soya bean variety trials, Agricultural Experiment Station, Salisbury, 1925-26. Hitherto this crop has given very poor results, but some varieties have yielded moderate crops this season. It provides a very valuable legume hay.



Sweet potato variety trials, Agricultural Experiment Station, Salisbury, 1925-26. The variety in foreground is Early Butter.

Buckwheat grown at Agricultural Experiment Station, Salisbury, 1925-26. This crop makes heavy demands on the plant food in the soil and is not, therefore, a suitable crop for preceding maize. The tall variety on the right yielded 22,800 lbs. per acre of green fodder and 1,260 lbs. per acre of seed.

Linseed Variety Trials.—On the whole the season was a favourable one for this crop, though the late rains caused some difficulty in harvesting the seed on the plots which were sown early in the season.

The possibility of utilising this crop for flax production is receiving attention, and two varieties—Saginaw and Pskoff—which are specially adapted for that purpose, have been introduced for trial. These were sown on small plots this season; they grew to over 4 feet high and yielded seed freely. The preliminary test therefore may be considered very satisfactory. They were grown primarily for seed, and had they been sown as thickly as is usual when the crop is grown for fibre, they would probably have yielded more than the 1,400 lbs. straw which is recorded in their favour.

The following table gives the yields of seed and straw of a number of varieties which have been under cultivation here for the past six years, as well as the two recent introductions.

Linseed Variety Trials: Yields in Lbs. per Acre.

Variety.	1925-26.		1924-25.	
	Straw.	Seed.	Straw.	Seed.
Large-seeded ...	658	240	1,168	496
White-flowering ...	928	440	880	352
Small-seeded ...	935	590	732	335
Yellow-seeded ...	860	540	720	328
Selection A.E.S. 1 ...	1,120	540	1,149	453
Saginaw	1,380	635	...	...
Pskoff	1,420	680	...	...

Dolichos, Bonavist or Hyacinth Bean.—This bean is becoming more popular every year among Rhodesian farmers. The small brown-seeded variety gives the heavier yield of seed, but the white-seeded varieties usually provide the larger crops of fodder.

Last season the seed of fifteen varieties was received from

the U.S.A. Department of Agriculture, and they were sown here in small trial plots. Only five of these seeded sufficiently to admit of their further trial alongside of our older varieties.

Dolichos Bean Variety Trials: Yields in Lbs. per Acre.

Name.	Yield of green fodder.		Yield of hay.		Yield of seed.	
	1924-25	1925-26	1924-25	1925-26	1924-25	1925-26
Indian	22,275	16,680	6,750	5,460	175	140
Ewanrigg	25,650	21,120	7,326	5,760	165	160
White-seeded ...	24,570	21,540	6,784	5,780	210	170
Small brown-seeded ...	16,200	19,380	4,563	5,340	390	450
Large brown-seeded ...	11,160	9,660	3,006	3,180	80	90
New Introductions—						
137/24 ...	...	18,420	...	6,000	...	380
138/24 ...	...	17,820	...	5,760	...	310
139/24 ...	...	18,240	...	6,180	...	90
144/24 ...	...	14,460	...	4,560	...	90
145/24 ...	...	12,180	...	3,360	...	15

The new introduction, No. 145/24, has erect stems instead of the long trailing vines common to the other types, but owing to its dwarf habit, its yield of fodder is considerably less than that of the majority of the other varieties. It flowered profusely last year, but its yield of seed was very disappointing.

Velvet Beans.—These are now well known throughout Rhodesia, and are one of our best crops for soil improvement by green manuring. They yield large quantities of foliage suitable for hay or silage and the seed provides a concentrated feed for live stock. During the past five years it has received increased attention at this station, and some fourteen or more varieties have been collected and tested. The standard varieties grown in the country by Europeans for the past twelve years have been compared with others obtained

from remote native kraals, which are claimed by the natives to have been grown by them for generations. In addition to these, through the courtesy of the U.S.A. Department of Agriculture, several new kinds have been received from that country. Of these new varieties, both Osceola and Tracey's Early Black have consistently given higher yields of seed than any of the better known varieties. Those farmers who use the velvet bean seed for stock food would be well advised to give these new kinds a trial.

The varieties known as *Stizolobium pachylobium* and *S. hassjoo* have stinging hairs on their pods, whilst their vegetative growth is less luxuriant than that of several of the other kinds. For these reasons they are deemed to be less suitable for local conditions than the others, so they will not be included in further trials.

Another variety called "black-seeded" has also been discarded because of the low yields, which were the outcome of its susceptibility to fungoid leaf diseases.

Velvet Bean Variety Trials: Yields in Lbs. per Acre.

Variety.	1925-26.		1924-25.		1923-24.		1922-23.
	Seed.	Hay.	Seed.	Hay.	Seed.	Hay.	Seed.
White Stingless ...	524	2,640	282	1,877	810	4,000	804
Fungwe	288	1,680	356	2,640	689	4,140	612
Mtoko	264	2,700	291	3,240	314	3,312	516
Urungwe	288	2,220	323	2,220	684	2,794	...
Stizolobium taborense	528	2,040	620	1,995	581	2,196	972
Florida	198	1,700	92	1,972	1,204	3,640	837
Bush	192	1,620	89	1,016	968	1,936	25
Chinese	264	1,740	420	2,628	600	...	...
Georgia	792	3,120	358	2,444	180	...	...
Stizolobium hassjo ...	600	1,040	270	976	1,205	...	...
Stizolobium pachylobium	576	1,020	259	1,056	1,300	...	...
Osceola	1,656	2,580	1,692	2,121	2,200	...	...
Tracey's Early Black	1,080	3,000	903	3,249	2,300	...	...

Distance Planting Trials with Velvet Beans.—The ideal rate of seeding for any crop varies according to the variety used, the nature and quality of the soil, climatic conditions, the purpose for which the crop is grown, and the pests which are likely to attack it. Obviously, therefore, it is impossible to lay down hard and fast rules which can be rigidly followed in every case. It is well known that as a general rule when the production of seed is aimed at, the individual plants should be allowed ample space for development, but if a maximum yield of fodder is required they must stand closer together. Extremes must be avoided, for stands which are either too close or too sparse cause reduced yields.

Distance planting trials for maximum top growth of velvet beans were made here this season on land which yielded eight bags of maize per acre last year, with the following results:—

Distance planted.	Seed required to sow an acre.	Green fodder. Lbs. per acre, average of two plots.
36 inches x 18 inches	21	5,772
36 inches x 12 inches	34	7,740
36 inches x 8 inches	45	7,464

These trials indicate that on moderately fertile soil when the rows are 3 feet apart, the seed should be sown from 6 to 9 inches apart in the row, or about 50 lbs. per acre. This will allow for some reduction of the stand by pests and implements used to keep down weeds during the early stages of growth and ensure a maximum top growth for ploughing under. On land of low fertility as much as 75 lbs. of seed will be required per acre, and the rows should not be more than 2 feet apart. In such cases, however, it will probably be more economical to apply farmyard manure or phosphatic fertiliser to the green manure crop and use less seed.

Haricot Beans.—Several varieties of these beans have been grown here for the past seven years, but the yields obtained have not been sufficiently high to permit of their recommendation for growing except as a catch crop. The reason for the low yields obtained here is probably because the soil is too light, and that they are usually sown on land which has been heavily cropped for some years.

These trials include the Tepary bean, though it is a totally different kind of bean, but is used for the same purposes as the haricot bean. During the past two seasons its yields have been rather low, as it thrives best when the rainfall is below normal, and for this reason it is recommended for areas in which the rainfall is limited.

Yields in Lbs. per Acre of Dry Beans.

Variety.	1925-26.	1924-25.	1923-24.	1922-23.	Average.
Lyonnais	615	237	738	995	646
Parisian	420	184	900	977	620
Natal Sugar ...	745	193	792	750	620
Mont d'Or ...	560	235	882	784	615
Red Canadian Wonder	550	222	1,044	470	571
Black Haricot ...	405	33	810	558	451
Algerian White ...	502	180	...	...	...
Canterbury White ...	490	242	...	...	...
Tepary	220	210	918	363	428

Soya Beans.—Trials with these were continued this year, and have proved more successful than last season. Better stands were obtained and the weather was more favourable, which, coupled with a dressing of six tons per acre of farmyard manure, resulted in an increase of 100 per cent. on the previous season's yields. Uneven ripening and shattering of a part of the crop, before the remainder is ripe enough to harvest, reduced the yield of some of the varieties. O-too-tan proved itself superior to the others again this season with a yield of nearly five bags of seed to the acre. This yield, however, is not heavy enough to admit of its cultivation for seed at the present market value of 8s. per 200 lbs. Nevertheless, stock owners might find in it a profitable crop for its hay, which, when well cured, is much relished by stock, and its value as feed is equal, if not superior, to that of clover or lucerne.

Yields of Soya Bean Seed in Lbs. per Acre.

Variety.	1925-26.	1924-25.	Average for two seasons.
O-too-tan	930	438	684
Haberlandt	742	120	431
Columbia	591	227	409
Biloxi	500	205	352
Laredo	506	218	362
Virginia	550	130	340
A. K.	537	90	314
Virginia No. 131	302	106	204
Ito San	181	90	135
Jet	181	45	113
Sable	90	76	83

Mung Beans.—Further trials were made with this crop during the season under review, but its yields of fodder and seed were not nearly as high as those of our better known velvet and dolichos beans. On land which had received nine tons of kraal manure per acre it yielded one ton of dry fodder as against a quarter of that amount from the unmanured plot alongside of it. This shows that it demands a fairly fertile soil, and it is thought that under similar conditions there are several other crops which could be more profitably grown.

On another plot it yielded 260 lbs. per acre of seed and 1,440 lbs. per acre of dry fodder, against 190 lbs. per acre of seed and 1,860 lbs. per acre of dry fodder from Florida velvet beans, which occupied the adjoining plot. During the early stages of its growth, it is subject to attacks by Ootheca beetles, which perforate its leaves and retard its progress considerably.

Owing to the uneven ripening of the seed and its liability to shatter as soon as it is ripe, three or four separate gatherings are necessary at intervals of seven to ten days, in order to secure the whole crop.

Its comparatively low yields of fodder and seed, its susceptibility to insect pests and the difficulty of harvesting its seed make it less suitable for local conditions than such crops as dolichos bean, velvet bean, cowpeas, soya beans and dhal.

The Wedge Pea.—This crop has been grown here for four seasons, and on the whole it has given very promising results. During the season under review it attained a height of nearly 3 feet, and yielded over 1,000 lbs. of seed per acre. Unlike the Black-eyed Susan peas, Dun peas, etc., it does not suffer from mildew or other leaf disease when it is grown as a summer crop.

Phaseolus Helvolus (or Amberique Bean).—A larger plot was allotted to this crop this season, so that its merits might be better investigated. The seedling plants were damaged to some extent by bean stem weevil and Ootheca beetles, but as soon as the preliminary stages of growth were passed very rapid progress was made and no further trouble was experienced from pests or diseases of any kind. The vines of this bean are finer than those of the dolichos bean, so that its hay is more attractive and possibly more palatable. Its yield of fodder is equal to that of the dolichos bean, but during the season under review it failed to seed as freely as its numerous flowers promised. Its yield of seed was 90 lbs. per acre; its yield of green fodder was 27,060 lbs. per acre, and when this was converted into hay it weighed 7,200 lbs. Further trials will be made with this bean, and the results will be reported in due course.

Kudzu Vine.—This perennial leguminous vine continues to give heavy yields of fodder on the plot which was established in 1919. No manure or fertiliser has been applied to this plot at any time, and the top growth has been removed each year, but its vigour seems to increase with its age. This characteristic distinguishes the Kudzu from all other leguminous fodder crops yet introduced, and makes it worth while to give it special care for a year or two when it is first laid down, in order that a thick stand may be secured. It is a particularly desirable crop for the stockman on account of the comparatively large amount of green fodder which it provides early in the season, regardless of whether rain

falls or not, and at a time when green food is very scarce. This green fodder is equal in feeding value to red clover.

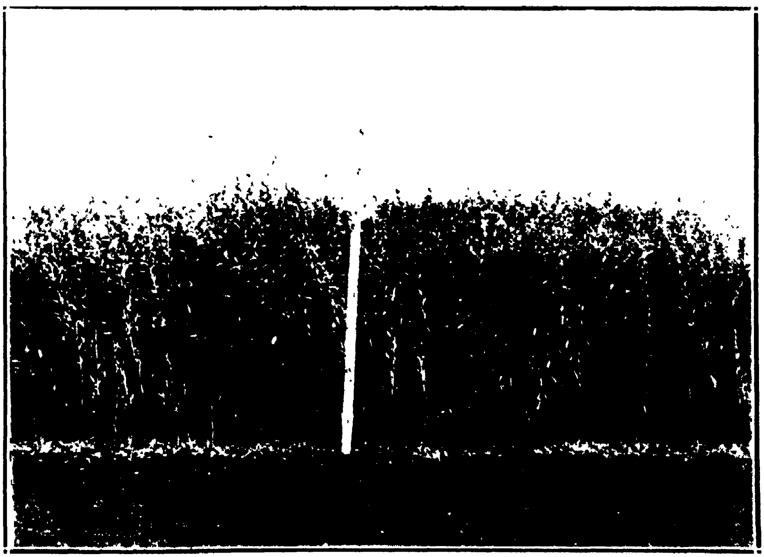
During the season under review, a yield of three-and-a-half tons per acre of green fodder was taken from our six-year-old plot during the early part of November, and in the following April a further two-and-a-half tons of hay per acre was obtained.

Edible Canna (Canna Edulis).—A few roots of this plant were received through the courtesy of the United States Department of Agriculture from the Experiment Station at Honolulu in 1922. The roots are branched and are somewhat similar to Jerusalem artichokes, madumbies, etc.

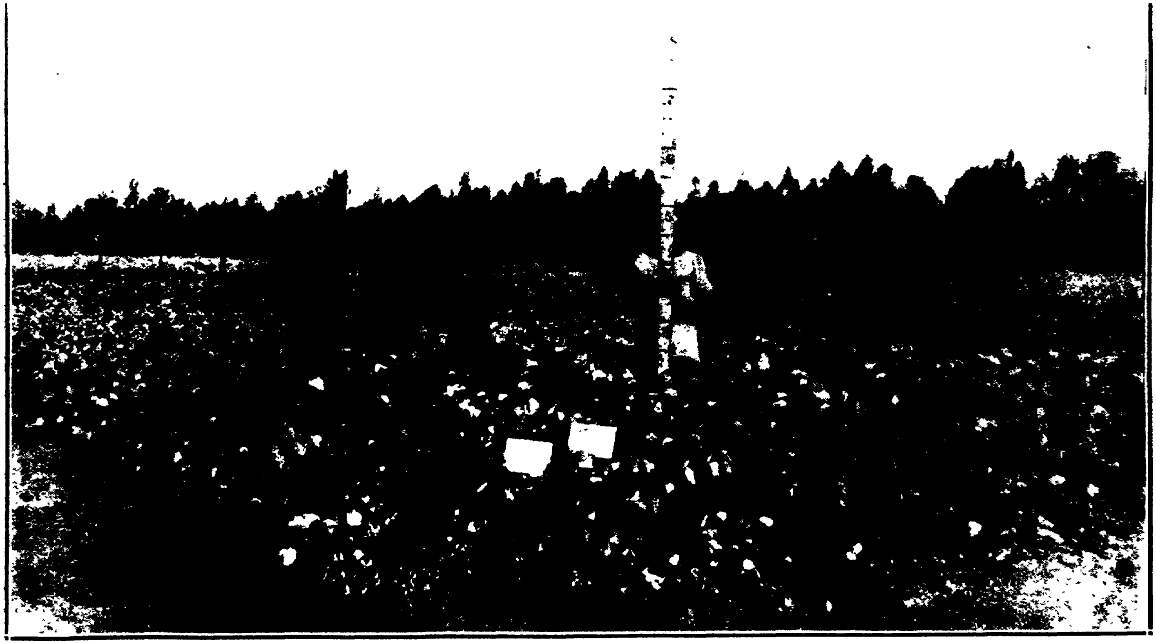
In South America, its native country, it is used for human food, but in Australia the plant is chiefly grown for starch. It prefers loose, loamy and well drained soil, and under favourable conditions is reported to produce an average yield of 20 tons of tubers per acre. The tubers have excellent keeping qualities, and for stock feed both tubers and tops compare favourably with that of other starch and forage crops. During the four years it has been under cultivation here it has grown well, and has not suffered from insect pests or diseases of any kind, so it promises to be of value in providing succulent winter feed for live stock. On fertile soil the tops grow to a height of 7 or 8 feet, and on a plot on which the tubers were planted on 18th December, 1925, a yield of 35,472 lbs. of green tops per acre was obtained in May, 1926. These were fed to cattle and were eaten with evident relish. The tubers were lifted a little later and a yield of 15,210 lbs. per acre resulted. When these were given to the cattle they were greedily eaten and all doubt as to their palatability was quickly dispelled.

So far the crop has been grown on an experimental scale only at this station, and whether or not it is superior to the sweet potato for succulent winter food remains to be proved. As compared with the sweet potato, points in favour of the edible canna are as follows:—(1) Its tubers can be kept in good condition for several weeks after they have been taken from the soil; (2) they can be planted at any convenient time, and if the soil is very dry at planting time the tubers remain dormant and unharmed until weather which is favourable for their growth arrives; (3) the leaves

Saginaw linseed grown at the Agricultural Experiment Station, Salisbury, from seed. This variety is suitable for flax production.



Sunn hemp has proved to be one of our best manure crops. It grows quickly, and by overcoming weeds, acts as a cleaning crop as well.



Kudzu vine, Agricultural Experiment Station, Salisbury. Photographed 26th November, 1925. Rainfall at date, 3.2 inches. The portion of the plot in the foreground was established in 1921-22. That in the background was laid down in 1918, and has yielded increasingly heavy crops of first-class fodder each year without manure or fertiliser.

are not damaged by light frosts, and they usually remain green for several weeks after sweet potatoes have died off; (4) though the leaves may become withered by frost and drought, the succulent stems escape and provide wholesome food for all classes of stock throughout the year; (5) the tubers belonging to each plant are concentrated in a mass near the surface of the soil and are easily lifted (because of this it is not difficult to clear the land when a change of crop becomes necessary); (6) it appears to be immune from serious attacks of insect pests or other diseases.

The sweet potato, however, has two advantages over the canna: (1) Because it can be propagated by stem cuttings, it is not necessary to retain a portion of the crop of tubers as "seed," and (2) owing to their irregular shape, a good deal of soil adheres to the canna tubers when they are lifted; this necessitates the expenditure of a certain amount of labour in the preparation of the food before it can be given to live stock.

Miscellaneous Experiments.—*Broom Corn* was sown again this season, but it was so severely attacked by stalk borer that the crop of brush was quite useless.

Kaffir Corn.—Twenty different varieties of this crop were sown, but stalk borers caused much damage among them. Some varieties were so badly attacked that they failed entirely, and the yields of the others were reduced by fully 75 per cent.

Kokoma Grass (Rottbœlia exaltata).—This native annual grass, in a comparative test with Sudan grass, yielded 19,530 lbs. of green fodder per acre, as against 8,540 lbs. of green fodder per acre from the Sudan grass. The Kokoma grass has been grown here during the past six years, and over that period it has not been affected by insect pests or other diseases of any kind. It has almost invariably given heavy yields of palatable fodder. It has spiny hairs on the lower portions of its stems and leaf sheaths, but they cause little inconvenience if the crop is cut while it is green and fed to stock or converted into silage.

Perilla.—This oil seed was tried again this season for the fifth time. It gave a yield of 204 lbs. per acre only. Owing to its consistently low yields, trials with this crop

will be discontinued, for its cultivation on a commercial scale cannot be recommended.

Adlay (Coix lacryma-jobi).—The seed of this plant is used in parts of Asia as a substitute for wheat. It is a native of India, and in the wild form the seed coats are hard and shiny, giving them a bead-like appearance. It is cultivated in America and Japan under the name of "Job's Tears," and its seeds are used for ornamental purposes. The varieties cultivated for grain have soft seed coats, which have to be removed before the floury kernels they contain can be used for human food. Six different varieties of this crop were introduced and tried this season. They were sown in November and germinated well, but their progress was very slow for the first two months. They tillered freely, each plant producing fifteen to thirty stalks, which resembled stout kaffir corn and grew to five or six feet high, but they failed to produce seed. The crop, therefore, could not be grown here for this purpose, except perhaps under irrigation. A portion of each plot was cut for silage in May, and the yields of green fodder ranged from six tons per acre to twelve tons per acre. The part of fodder not used in this way remained on the plots through the winter, during which its leaves were killed by frosts, but the stems retained their succulency and were much appreciated by the cattle in September. Stalk-boring caterpillars resembling those which attack kaffir corn were found in a few of the stems, but the infestation was too slight to cause appreciable damage. No other insect pests or diseases attacked the crop.

Adco Synthetic Manure versus Kraal Manure.—Investigations with the object of finding means for accelerating the process by which vegetable matter can be converted into manure have been perfected at the Rothamsted laboratories, and as a result of these researches compounds known as Adco mixtures are now available, by the aid of which almost all kinds of vegetable matter may be converted into a substance similar to farmyard manure in a few months.

The manner in which the vegetable matter should be treated was fully described in the *Rhodesia Agricultural Journal* for July, 1925, reprinted as Bulletin No. 545, where the results of our first series of experiments will also be found. These trials are being continued, and this year a new series has been added to them.

Potatoes are used as the first crop for determining the value of the various manures, and after that maize occupies the land for two seasons to test the lasting effect of the treatment. The manures are spread in the bottom of the furrows which have been prepared for the potatoes, and these are then planted on the manure.

SERIES "A."

Adco Manure versus *Farmyard Manure.*

Manures applied November, 1924, at the rate of 10 tons per acre.

Kind of manure.	No. of plots.	Average yield potatoes, lbs. per acre. 1924-25.	Average yield maize, lbs. per acre. 1925-26.
Farmyard manure	3	14,346	5,370
Manure from maize stalks ...	2	13,103	5,450
Manure from green grass ...	2	12,153	5,280
Manure from dry grass ...	2	9,815	4,717

SERIES "B."

Adco Manure versus *Farmyard Manure.*

Manures applied November, 1925, at 12 tons per acre, plus 400 lbs. per acre of Potato Fertiliser. Potatoes planted 15th November.

Yield of Potatoes.

Kind of manure.	No. of plots.	Average yield, lbs. per acre.	Bags of 150 lbs.
Farmyard manure	3	18,141	120
Manure from green Mexican marigold	2	17,087	113
Manure from green grass ...	2	16,122	107
Manure from maize stalks ...		15,688	104
Manure from dry grass ...	2	13,400	89
No manure	2	5,280	35

An ample supply of water is essential for the successful conversion of vegetable matter into manure by this process. In 1924-25, when the summer rainfall was abnormally heavy, the rain-water alone was sufficient to rot down all the different kinds of vegetable matter under trial, but in 1925-26 only those heaps which had been prepared prior to the advent of the seasonal rains received enough water by natural means to bring about the complete disintegration of their contents. The heaps of grass, each containing one ton of dry material, which were prepared in January, 1926, required about 1,000 gallons of water in addition to the natural precipitation. It is obvious therefore that when the natural rainfall is to be the chief source of moisture the material must be distributed over as large an area as possible, care being taken, however, not to spread the material in such a thin layer that the moisture secured in this way is lost again through excessive evaporation. Stacks of grass which are about four feet high have been found to give the best results, and if they can be built in a situation which is sheltered from the wind and shaded from the sun, evaporation due to those agencies will be reduced to a minimum.

These experiments prove that valuable manure can be made without the assistance of farm live stock from material which is available on nearly every farm, but it is not suggested that synthetic manure should be made by farmers who have enough cattle to use for making the natural product. It is thought that the majority of cattle owners can obtain as good manure at a lower cost by allowing their cattle to trample over the material after it has been spread in the yards.

It is well known that the excreta of farm animals have a stimulating effect on the micro-organisms which are responsible for the conversion of vegetable matter into manure, and it is found here that maize stalks and other similar material are converted into manure much more rapidly in the cattle kraals than they are in heaps to which the Adco mixture has been applied.

Extracts from the Report of the Secretary, Department of Agriculture,

FOR THE YEAR 1926.

General.—On account of the increasing volume and varied nature of the activities of the Department it would be difficult to deal fully in my report with all matters affecting the different branches, and more extensive particulars will be found in the reports of the heads of the various branches of the Department. Many calls have been made on the technical officers of the Department during the year, and it is most gratifying to find their services and advice are so much in demand. It is hoped that both established farmers and new settlers will continue to make full use of the agricultural staff. Every effort is made to arrange for the visits of technical officers being distributed as evenly as possible throughout the country, and, although it may not always be possible to arrange for officials to visit districts or farms when desired, endeavours are made to meet all demands for visits or advice.

Farmers' associations should communicate with the Department and submit dates on which it is desired that officials should attend their meetings or visit their districts. At these meetings lectures on various subjects affecting agricultural matters generally can be given. Lectures of this nature should be of much assistance, not only to new settlers, but also to farmers with a limited knowledge of agriculture. It is very desirable, however, that farmers' associations should co-operate with the Department in connection with the arrangement of tours and visits of the technical staff, and applications for the services of these officers should be forwarded to the Department as early as possible in the year so that suitable itineraries can be drawn up.

Crops, 1925-26.—The conditions for the growing of crops in the early part of the season promised good results, but heavy and fairly continuous rains in February and March, with little sunshine, caused a certain amount of damage, not only to tobacco and cotton, but also to the maize crop. In spite of this, however, the maize crop yielded approximately 1,400,000 bags, which is the second highest total on record. The crop for the 1922-23 season is so far the highest on record for this Colony and totalled over one and a half million bags. With the increased acreage brought under cultivation during the year under review, there is every prospect of the maize crop for 1926-27 exceeding all previous returns. In the mealie-growing districts in Mashonaland the outlook so far is most promising, but much will depend on getting rains when they are most needed. Unfortunately, the rainfall in portions of Matabeleland has been most disappointing, and the crops there are likely to be seriously affected.

The tobacco crop reaped amounted to over 5,000,000 lbs. of Virginia and 346,000 lbs. of Turkish leaf. As in maize, the acreage planted to tobacco during the year shows a big increase, and, given a normal season, should more than double last year's total. Many growers will probably find that the least difficult part of a tobacco crop is the growing. Good crops can very easily be ruined in the curing stage, and the question of grading is a matter for which farmers must make satisfactory provision. The existing facilities for grading of tobacco leaf are likely to be quite inadequate for coming requirements, and this is a matter which growers should see to themselves without delay. Many tobacco growers show little inclination to undertake the grading of their leaf, and prefer to rely on existing establishments for doing this work. With the increasing production of the tobacco crop, however, it is very evident that growers must either do their own grading or co-operate and provide for district grading arrangements at convenient centres. If farmers can possibly grade their crops on their own farms this would seem to be the most satisfactory method, but, failing this, it might be possible to form district co-operative grading establishments.

The cotton crop, although in excess of the previous year's total, was disappointing, but to a certain extent this

is accounted for by unsuitable weather and the poor class of seed used in a good many cases. The latter cause will to a great extent be remedied in time, and much useful work is at present being carried out at the cotton seed breeding station at Gatooma with a view to finding the varieties of cotton most suitable to the climatic conditions of this Colony. There is no reason to anticipate that cotton should not eventually be profitably grown in Southern Rhodesia, but before this stage is reached a good deal of experimental work will have to be done.

In both tobacco and cotton the inclination in many cases has been for growers to pin their faith to one crop, and the danger of doing so will probably only be realised by experience. It is most desirable that caution should be exercised in growing crops such as tobacco and cotton. A reasonable acreage well attended to is a much safer method to adopt and is likely to give more satisfactory results. In order to minimise the risk of total failure through the loss of any particular crop, mixed farming is most necessary, and this is probably being more and more recognised. The result of this is that cows, pigs and poultry are being given more attention, and in many cases are carrying farmers over lean years.

The monkey nut crop is likely to increase, but, like other crops which might be classed more or less as side lines, ground nuts in many cases have not received sufficient attention. There is no reason, however, why this crop should not be profitably grown, but more care will have to be taken to give the crop a fair chance of making good.

It is surprising that so little attention is given by people keeping cattle to the growing of sweet potatoes. This is a most valuable crop and one which can carry the dairy cow over many months in the year. The green tops are usually available from December until April or May, and the roots, which are greedily eaten by cattle, can then be used as feed.

Certain districts are giving more attention to the growing of crops for green manure, and this is a method of manuring deserving much more attention than it has so far had.

In very few districts are potatoes grown for export, and about 60 per cent. of the whole crop is grown in Salisbury district.

The growing of sunflower, except for ensilage or stock feed, is not largely undertaken, and the total output from this crop has been on the decline for the last year or two.

Other crops call for no special comment.

The total area under cultivation for summer crops for the year 1925-26 was approximately 355,500 acres, being an increase of over 20,000 acres on the total of the previous year. Unfortunately, owing to the failure of numbers of farmers to render their agricultural returns, figures given are only approximately correct, but the margin of error is probably very small.

The report and statistics of summer crops grown by Europeans for the season 1925-26 provide interesting information, and will be found in Departmental Bulletin No. 626 and also in the February issue of the *Rhodesia Agricultural Journal.*

Cattle.—There was little or no advance in the price of slaughter cattle during the greater portion of the year, but latterly prices have been hardening and there is every likelihood that they will improve further. The rising price is probably due to the number of cattle purchased for slaughter by the Imperial Cold Storage Company and to increasing demands from the Congo. Dairy cows still command good prices, and the demand for this class of animal is likely to increase.

The total exports of cattle for the year amounted to 74,646, being an increase of 13,098 on the total for the previous year.

During the last five years the totals of the cattle exported were as follows:—

1922	23,938
1923	34,841
1924	50,770
1925	60,545
1926	74,646

It will thus be seen that the yearly exports show a satisfactory and steady increase. The numbers of cattle slaughtered for local consumption must also have increased considerably.

For the purpose of comparison the cattle exports for the years 1925 and 1926 and the centres to which the animals were exported are shown below:—

	1925.	1926.
Union of South Africa	9,591	12,250
For slaughter for overseas (Imperial Cold Storage)	35,675	49,595
To England and overseas (on hoof)	236	310
Belgian Congo (for slaughter)	4,768	9,016
Belgian Congo (trek oxen)	383	...
Belgian Congo (for breeding)	9,269	2,829
Northern Rhodesia (for breeding)	85	32
Portuguese East Africa	538	614
Totals	60,545	74,646

From this it will be seen that, although the export of breeding cattle shows a decrease, the increase for slaughter purposes exceeds 20,000.

Attention might be drawn to the large number of cattle purchased by the Imperial Cold Storage for slaughter for the overseas market. This outlet for cattle has been of the greatest value to many farmers and cattle breeders. When the new cold storage works are opened in Bulawayo the export figures will no doubt drop, but the market will still be available, and, although prices may never reach the high-water mark obtained some years ago, there is no reason to anticipate that prices giving a fair margin of profit to the breeder should not be available.

Sheep Experiments.—During the year, with a view to ascertaining how sheep farming is likely to succeed, sheep experiments have been commenced in five districts in the Colony, viz., Melsetter, Rusape-Headlands, Somabula, Bembesi and Plumtree. It is too early to give an opinion as to the result of these experiments, but with care and attention there would seem to be no reason why sheep farming should not be successfully carried on in numerous parts of the Colony. There is no doubt, however, that sheep require

close attention; but given this, they should prove a profitable undertaking. The breed of sheep used for the Government experiments is the merino, but there are crosses which would no doubt do well, and the fact of merinos being selected for the experiment does not necessarily mean that they are the most suitable or profitable for Southern Rhodesia. It is likely, however, that this particular breed will be found to be most generally suitable from a commercial point of view; but it may be found advisable, if more weight is desired, to cross the merino with some heavier breed.

British Farmers' Visit.—The British farmers touring South Africa were able to devote a short portion of their visit to this Colony. Every effort was made in the limited time available to show the visitors as much of the country as possible. Much interest was displayed by the tourists, and from many expressions of opinion given, the general feeling appeared to be that the country gave much promise from a farming point of view. As a result of this visit a number of new settlers of an excellent stamp have come to Southern Rhodesia and taken up land. Many enquiries have been received with regard to the conditions relating to the acquisition of land, and much good will no doubt result from the visit of the British farmers, many of whom had an intimate knowledge of agriculture and stock. They no doubt realised that the class of settler most likely to succeed would be what might be termed the pioneering settler and those who could use their hands as well as their heads; and if they can encourage this stamp of settler to come out, there should be no anxiety as to the result. In good seasons settlers of this stamp will do well, and in lean years they will hold their own.

Native Labour.—This matter was referred to in my last year's report, and it was then stated that labour difficulties were likely to become more acute. Many communications have during the last twelve months appeared in the public press, but it is doubtful whether any really feasible solution has so far been put forward. There is little doubt that the matter is a difficult one, requiring much careful thought and consideration. A satisfactory solution of the difficulties will not be easy, but it would almost seem that the only method

likely to give relief would be to obtain more efficiency from the available labour supply.

This view may not commend itself to those who are under the firm belief that there is an abundant native labour supply in the country, and that it only requires strong measures to obtain native labour for all requirements. It will be found on examination of the census figures and labour returns that a very large percentage of the able-bodied native population is working, and even if a greater percentage were available, it is doubtful whether the position would be eased to any appreciable extent. Assuming that this is the position, it seems clear that the natural course to adopt is to obtain more efficient and intelligent work from the supply of labour available. It may be contended that this would be no easy matter, but by example and patient instruction much could probably be done to improve matters. It is well known that the native mind works slowly and that natives are slow to grasp instructions. On account of this it is necessary for them to be shown and led rather than driven towards efficiency. The sense of responsibility of the native cannot be expected to develop with any rapidity, nor can his intelligence be expected to suddenly reach a high level mark, but there seems no reason why, with careful and capable instruction, the efficiency of the average indigenous farm labourer should not be vastly improved. A cheap and plentiful supply of inefficient labour is never likely to be either satisfactory or economical, and the want of knowledge, energy and intelligence makes labour of that class too costly for the average farmer. It would almost seem, therefore, that farmers would be well advised to strive for a higher standard of efficiency from the native labour supply available, and, as stated, this can only be arrived at by careful tuition. Most people who have had dealings with natives have no doubt realised that they must be shown and not told how to do things, not once, but probably many times. This, of course, means that the employer himself must know how to do things; but as many farmers, in addition to having a knowledge of agriculture, are also capable of erecting buildings and of carrying out the varied and many duties which have to be done on farms, the instruction of the native with a view to obtaining more efficient

work should not be a difficult undertaking, and would probably be time well spent. Natives are no doubt realising more and more the value of money, and they will naturally endeavour to obtain employment where the highest rates of pay are offering. It will, therefore, have to be realised that on account of the demand for labour wages are bound to rise, and that the rates paid in the past are not likely to satisfy the requirements of the future. To meet this increase of pay greater efficiency and more intelligent work are essential. Further, it is not unlikely that shorter hours and better housing arrangements will soon be demanded by native labourers on farms.

Farm management may be improving, and more scientific methods of agriculture are undoubtedly being introduced with satisfactory results, but care will have to be taken to see that inefficient labour is not allowed to become the restricting factor of farm economy.

African Coast Fever.—It has been rightly stated that African Coast Fever is a national question, and if this scourge is to be eliminated national co-operation and sustained efforts must be made to deal with it. Every owner of cattle should make a determined effort to assist the Government to rid the country of this disease, which periodically crops up in a most unaccountable manner. Without the closest co-operation of every cattle owner, however, the likelihood is that the disease will always be with us in a greater or lesser degree. It is only to be expected that people suffering heavy losses from this disease must at times lose heart, more especially when they feel that there are people in their neighbourhood who have neglected to carry out their obligations in keeping their stock clean and free from ticks.

It has been stated that irksome restrictions and heavy penalties as a means for dealing with people who have tick-infested cattle will never rid the country of African Coast Fever. It would perhaps be equally correct to state that Government supervision and inspection alone will have no better effect. If these views are correct it is essential that steps should be taken to find some effective means for dealing with this important matter, and one of the methods most likely to be successful might be for cattle owners themselves

to see that cattle in their own districts are clean, and that they are kept clean. By accepting this responsibility cattle owners would not only be protecting themselves, but would probably be doing more to rid the Colony of African Coast Fever than can ever be expected from stringent regulations, heavy penalties or Government supervision and inspection. Only by loyal co-operation with the Government and combined effort on the part of all cattle owners can it be expected to successfully combat the pest of African Coast Fever.

Loans for Farm Development and for Purchase of Stock.—The amount provided for farm development loans, amounting to £25,000, was rapidly distributed, and many deserving applications had to be refused. The repayment of loans granted under this heading has on the whole been satisfactory, considering the failure of cotton and tobacco crops in different parts of the country owing to the excessive rains. Of the original amount of £25,000 distributed, approximately 60 per cent. has been repaid. All amounts repaid, however, have again been distributed. In many cases these small loans have been the means of successfully carrying applicants over a difficult period, and although the amount originally provided was small, numerous hard-working and deserving farmers, who were just on the balance between success and failure, have been seen through a period when a little financial assistance just turned the scales in their favour, with the result that they were able to get through their difficulties successfully.

Applications for stock loans have been rather disappointing, but a good deal of difficulty has been experienced in obtaining a good class of animal, either male or female, and this no doubt accounts for more applications not having been received for loans under this heading. A considerable number of good pedigree bulls have been obtained under the loan scheme, and it is hoped that the coming year may show an appreciable increase in the numbers of animals obtained under the provisions of the funds provided for the purchase of pedigree bulls and dairy stock.

Staff.—During the year the following appointments have been made in the technical staff of the Department:—

W. Fleming, Stock Adviser.
J. C. Hopkins, B.Sc., Mycologist.
A. Cuthbertson, Assistant Entomologist.
A. D. Husband, A.I.C., Chief Chemist.
R. McChlery, B.A., B.Sc., Assistant Chemist.
Miss Anton, B.Sc., Assistant Chemist.
E. D. Alvord, Native Agricultural Instructor.
E. K. Hunt, District Tobacco Adviser.
B. M. Leffler, District Tobacco Adviser.
T. W. Williams, District Tobacco Adviser.
F. F. Carr, District Tobacco Adviser.
C. O. Jones, District Tobacco Adviser.
H. L. Matthews, District Tobacco Adviser.
H. Y. Hawthorne, District Tobacco Adviser.
G. W. Jones, District Tobacco Adviser.
W. W. Walker, District Tobacco Adviser.
R. P. Roberts, District Tobacco Adviser.

Mr. McKinstry, of the Empire Cotton Growing Corporation staff, has been seconded for duty in this Colony *vice* Mr. I. G. Hamilton, B.Sc., transferred.

The following officers have left the Department during the year:—

G. N. Blackshaw, Chief Chemist.
E. V. Flack, Assistant Chemist.

I again desire to place on record the good work done during the year by all members of the staff. The volume of work to be carried out has increased very considerably, both in the administrative and technical branches of the Department, and on many occasions a great deal of work has had to be undertaken outside the recognised office hours. This, however, has been willingly done, and I have to gratefully acknowledge the sympathetic co-operation and assistance received at all times from the whole staff of the Department.

D. McDONALD,
Secretary, Department of Agriculture.

Experiments with Fertilising Eucalyptus Trees.

By JAMES WATSON, Kilmuir.

An experiment in using fertiliser with young eucalyptus trees was carried out on the farm Kilmuir. The plantation was visited on the 27th April last by Mr. Henkel, the Forest Officer, who was much interested in the plots. Mr. Henkel asked a series of questions as to the procedure followed, and it occurred to the writer that the particulars supplied may be of interest to readers of the *Agricultural Journal*. The questions put are answered *seriatim* as follows:—

1. **Preparation of Land.**—The land—roughly 2⅓ acres, with a control plot of one-thirteenth of an acre—was virgin soil adjacent to plantations already established. Instead of being ploughed in the autumn preceding planting, as is proper, it was ploughed in December, disced several times and finally roughly levelled and cleaned up by boys. All these operations followed close upon one another and immediately preceded planting. It is quite a wrong practice. It is impossible to get land into condition for cropping if only broken in the rains preceding planting. The repeated discings had a tendency to pack the land. Such humus covering as was about, instead of being turned in to help tilth, had to be cleared off. Rains were prevalent during the operations of preparing the land and planting, and a muddy condition was present instead of a damp tilth, which would have been vastly more congenial to tree growth in the initial stages.

2. **Date of Planting.**—January, 1926.

3. **Size of Holes.**—After the land had been roughly levelled, holes about one foot deep were dug by boys using

hoes. At the bottom of the holes a boy placed the fertiliser, which was mixed with earth. The holes were then filled back with adjacent soil and small sticks of "Vaalbosch" placed in the centres to mark their positions. The transplants used were obtained from the Government Forest Nursery and were in the usual half trays. The transplants were set out the day following the making of the holes by the planting boys, who used their hands for making holes large enough for the plants. The usual care was taken to set the plants at the correct depth. Heavy rains were falling when the holes were made and during the planting period.

4. **Quantity of Fertiliser used per Tree.**—The quantity given to each tree was three-quarters of an ounce, measured in a small copper measure supplied by the firm from whom the fertiliser was obtained. The fertiliser used was a mixture prepared by a local firm in Salisbury, and contained a certain percentage of whale-meat meal.

5. **Effects noted to date (May, 1927) as compared with Control Plot.**—The plantation contained about 2,700 *E. rostrata* and *E. tereticornis* gums, including unnamed hybrids, planted at an espacement of 6 ft. x 6 ft. The control plot contained 70 trees of the same species.

I understand that in sylviculture fertilisers should not be used. I was advised by one of the Forestry Department officials not to use fertiliser. Had the land been properly prepared—that is, ploughed in autumn and put into a state of tilth—I might not have used it, except for experimental purposes. Fertiliser appeals to anyone anxious to get all crops growing to advantage, and the idea of getting the trees well away and well established in this country seemed sound, and the opinion—advanced by several authorities—that tap-rooted trees like eucalypts are changed in habit by finding choice food in proximity to their roots appears to me unsound.

With regard to the stand of trees, the fertilised portion suffered a good deal at first, and for nine months, from white ants, while the control plot appeared immune. Blanks were filled in twice within the first two months after planting, and the final stand now (May, 1927) shows a loss of about 400 trees, that is, about 15 per cent., whereas for twelve

The largest tree in the unfertilised control plot.

Showing difference between unfertilised and fertilised trees.
Kilmuir Farm.

General view of the eucalyptus plantation at 16 months. The trees in background are two years old. Kilmuir Farm.

The largest tree in the fertilised plantation.

A fine avenue of eucalypts at Kilmuir Farm, with citrus hedge. (Mr. Jas. Watson.)

months the control plot had very few blanks indeed. In my opinion the white ants were attracted by the whale meal, and it would appear advisable to substitute some other ingredient for that in further planting if fertilisers are to be used. Now that sixteen months have elapsed, and the trees grown out, the stand looks very good. Except in isolated patches, possibly it could be reckoned a 90 per cent. stand. It should be noted that in the control plot, which was conspicuously less blanky than the other (nearly a 100 per cent. stand), this effect is now offset by the fact that several of the less well-grown trees have succumbed, thus equalising stands between the two.

The difference in growth is very striking. The average height of the control is 2.2 feet, whereas in the main plantation the average, taken over all trees measured in the longest row (181 trees), is 6 feet and the highest tree in the plantation is 15 feet. The highest in the control stand is 4 feet 6 inches. (See the two photographs.)

No crop of any kind could show at a glance a greater difference resulting from the use of fertiliser than this small plantation.

Mr. Henkel very rightly says:—"It is important to see how long the effect lasts." He further said that in certain circumstances young trees which have been stimulated by fertiliser are apt to grow very vigorously during the rainy season and the period immediately following, and that during the long dry season before the summer rains begin the young trees receive a severe check and lose their leading shoots—in other words, might outgrow their strength and transpire too freely for available moisture. It appears unlikely, however, that any hurt will be noticeable in the plantation under review, one dry season having already passed and the trees doing particularly well. The point is that only a small quantity of fertiliser was used to send the young trees away and beyond the danger that immediately besets them upon planting out.

Winter Crops, 1926.

By A. Borradaile Bell, Statistician.

The total acreage under winter crops was 7,969 acres, which is 664 acres less than in 1925. The crops mainly responsible for this reduction in acreage are potatoes, which are 733 acres less, and barley, which is 232 acres less than in 1925. On the other hand, the acreage under wheat shows an increase of 226 acres.

The total number of farmers who grew winter crops in 1926 was 664 or 24 per cent. of the farmers in the Colony, but only 233 or about 8 per cent. of the farmers had 10 acres and over.

The yield per acre for all crops is higher than in 1925.

Potatoes.—The acreage under this crop was only 739 acres, or about half that for the previous season. The yield per acre was 22 bags, as compared with 16 bags in 1925. This crop is almost entirely controlled by local consumption, and the decrease in acreage follows on a drop in prices. With a smaller total crop there has been a corresponding rise in price. The total number of farmers growing potatoes was 385, but the vast majority only grow sufficient for their own requirements.

Salisbury district is responsible for the greater proportion of this crop, having 20 per cent. of the total acreage, producing 28 per cent. of the total crop.

Onions.—This crop is not grown to any great extent, the total land planted being only 74 acres. The yield of 33½ bags per acre is 11½ bags more per acre than in 1925.

Wheat.—This is the most extensively grown winter crop, the total acreage being 4,752 acres, or nearly 60 per cent. of the land under winter crops. Although there are

WINTER CROP STATISTICS, 1926.

District.	Total No. of acres.	POTATOES.		ONIONS.		WHEAT.		RYE.		OATS.		OAT HAY.		BARLEY.		BARLEY (cut green).	
		Acres.	Yield, bags 153 lbs.	Acres.	Yield, bags 123 lbs.	Acres.	Yield, bags 203 lbs.	Acres.	Yield, bags 203 lbs.	Acres.	Yield, bags 203 lbs.	Acres.	Yield, Tons.	Acres.	Yield, bags 203 lbs.	Acres.	Yield, Tons.
Wankie	18	...	...	14	484	4	12	...	...	...	...	...	...	...	...	...	...
Nyamandhlovu ...	7	7	32	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bulalima-Mangwe ...	42	8	189	...	...	5	5	...	...	...	...	15	7	...	...	14	18
Matobo ...	103	28	427	...	...	2	...	3	...	...	...	46	10	...	...	24	53
Umzingwane ...	125	18	575	2	40	93	422	...	...	...	...	12	15	...	...	...	...
Bulawayo	13	5	118	1	14	...	...	...	...	...	...	...	...	...	...	7	4
Bubi	43	6	93	1	17	2	6	1	3	...	...	29	80	...	...	4	12
Sebungwe	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gwelo	270	73	1,033	5	124	118	184	6	...	4	12	28	29	11	46	25	50
Selukwe	32	15	498	...	...	...	...	...	...	...	...	9	12	...	...	8	13
Insiza	159	55	1,093	3	170	44	125	...	...	7	35	28	28	...	...	22	45
Gwanda	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	12
Belingwe	16	14	104	2	40	...	...	...	...	...	...	...	...	...	...	...	...
Victoria	321	34	923	3	258	248	772	3		4	8	18	23	2	23	9	5
Chilimanzi	983	27	140	2	35	845	1,959	13	23	10	10	47	22	11	23	28	20
Hartley	666	20	312	1	10	429	555	5	5	134	88	54	19	20	12	3	2
Lomagundi	78	32	577	3	128	8	33	1	...	...	...	25	13	...	...	9	2
Mazoe	499	62	2,225	7	234	172	876	...	...	48	277	85	115	96	596	29	13
Salisbury	883	149	4,485	7	210	293	475	4	4	91	198	233	266	14	93	92	353
Marandellas ...	125	19	394	...	...	42	81	3	...	11	75	16	25	6	15	28	18
Charter	1,752	48	826	1	48	1,518	3,693	2	7	64	205	105	93	2	4	12	9
Gutu	210	14	75	1	40	170	378	1	...	1	10	12	6	5	3	6	6
Ndanga	38	9	210	...	...	20	79	...	...	...		1	...	8	40	...	...
Chibi	2	2	10	...	...	...	...	...		...	...	...	...	...	...	...	...
Bikita	3	1	5	...	...	2	8	...		...	...	...	...	...	...	...	...
Melsetter	515	14	104	2	23	370	995	4	...	15	68	77	32	14	79	19	20
Umtali	584	32	726	2	42	128	371	2	...	19	79	261	215	50	237	90	95
Makoni	305	30	619	17	566	99	225	41	84	13	31	52	32	46	173	7	8
Inyanga	169	12	157	...	...	140	509	...	...	4	11	4	1	6	28	3	4
Mrewa	5	5	180	...		...	...	...	...	...	...	...	...	...	...	...	...
Mtoko	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...
Darwin	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...
	7,969	73	16,130	74	2,483	4,752	11,763	89	126	425	1,107	1,157	1,043	291	1,372	442	762

a few growers in almost all districts, wheat is principally grown in the Charter, Chilimanzi and Melsetter districts, which have 57 per cent. of the land planted to this crop. There were 308 farmers growing wheat, of which number 143 were in the three districts mentioned above. The total production was 11,763 bags, but the yield per acre was low, averaging only 2½ bags per acre. This production of roughly 2,400,000 lbs. is a very small proportion of the total consumption of the Colony. The imports of wheat in 1926 were 10,795,479 lbs., and of flour 4,016,513 lbs., the total value being £112,000. The exports of flour amounted to 2,663,284 lbs., valued at £26,000.

Rye.—Only 89 acres were grown, of which 37 acres were fed to stock. The yield for 52 acres averaged 2½ bags per acre.

Oats and Oat Hay.—The land planted for the purposes of grain was 425 acres, which yielded 1,107 bags, an average of 2.6 bags per acre. This is a small increase both in acreage and yield as compared with 1925. The land planted for oat hay was 1,157 acres. Of this, 986 acres yielded 1,043 tons and the yield from 171 acres was fed to stock and no record kept. The yield is rather more than one ton per acre. The production of the Colony is about half the consumption, for the imports were 1,596 bags, valued at £1,021, and the exports 419 bags. The excess of imports over exports is 1,177 bags, which is slightly more than the total production.

Barley.—The area planted to this crop was 733 acres, of which 291 acres yielded 1,372 bags, an average of 4.7 bags per acre; 347 acres yielded 762 tons, an average yield of 2.2 tons, and 95 acres were fed to stock. The acreage planted was 232 acres less than last season, but the yield per acre was slightly higher.

The Sabi Valley Irrigation Scheme.

By J. Tawse Jollie.

The valley of the Sabi is little known to most Rhodesians, although its geology has received some attention. Recent finds of gold and copper have attracted notice, whilst its large deposits of anthracite have been well known for many years.

The possibilities of cotton first drew attention to the agricultural potentialities of the valley, as the dry conditions there appeared to offer similar conditions to those obtaining in Egypt. When cotton comes into its own again it is certain that the Sabi Valley will produce large quantities of a long-stapled variety, for two successful experimental crops have produced very fine yields.

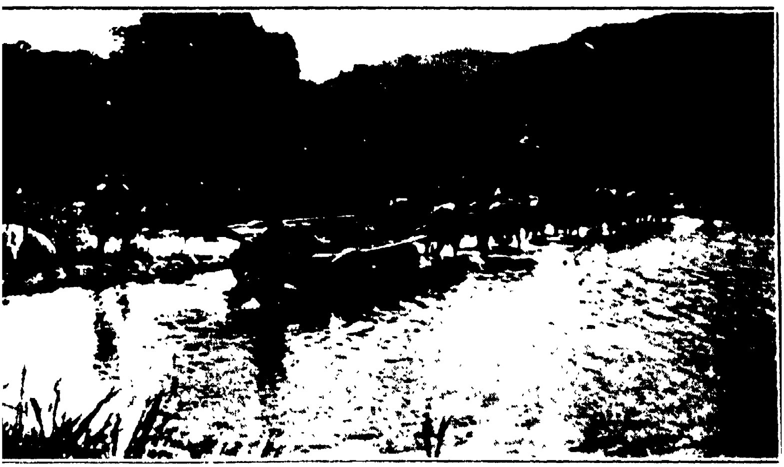
The valley was very inaccessible until five years ago, when the South Melsetter farmers obtained from the late Administration a grant of £400 on the £ for £ principle for the construction of the Sabi road (as it is called) to connect Chipinga with Umtali, which is the *entrepot* for the district. It was built under the supervision of an engineer provided by the farmers themselves, and is probably the finest stretch of road in Rhodesia. The present Government has constructed two very fine drifts over the two principal rivers and improved it continuously, so that Chipinga, from being a four days' journey from Umtali, is now within seven hours by car of Umtali, a distance of 122 miles.

The first to break ground in the valley was the Sabi Valley Cotton Syndicate, which has since become the Sabi Valley Development Company, Ltd. Owing to the very low rainfall—variously estimated at from 8 to 15 inches (this year 5)—irrigation was an essential to any scheme of planting. Commencing work on their irrigation scheme last July,

Entrance to flume.

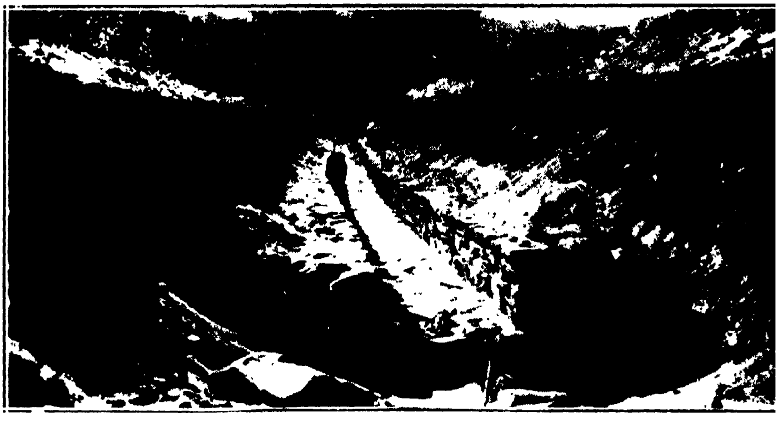
The weir across Tanganda River. Sabi Valley Irrigation Scheme.

View of flume over drainage crossing



Completing weir with gravel. Sabi Valley Irrigation Scheme.

Calco sluice gates and Armco culverts at intake on weir at Tanganda River.



First section of canal ready to instal sluice gates. Sabi Valley. Irrigation Scheme.

Experimental plot of six acres of White Burley tobacco. Planted in February, 1927, and photographed in April. Rainfall during growing period, 5 inches. Estimated yield, 1,200 lbs. per acre.

Thirty acres of Salisbury White maize under irrigation. Planted late December; photographed in March. Sabi Valley Irrigation Scheme.

under the advice of Mr. P. H. Haviland, Assistant Irrigation Engineer, the irrigation works have now been completed.

The work consists of a weir of the net boulder type thrown across the Tanganda River, which is known to be one of the most permanent streams in Melsetter district, flowing west into the Sabi River about five miles below the weir. It was not found necessary to raise the level of the water more than 2 feet 6 inches—a very simple matter and at small cost. The irrigation canal is taken out at a point about 200 feet above the weir, almost at right angles to the river, through a bank about 8 feet high, and thence it is carried for about a mile parallel to the Tanganda River through some difficult ground—parts of the cuttings are over 10 feet in depth. At the end of this mile a dry river bed was encountered, which necessitated fluming the water across in a flume about 180 feet long and 12 feet high at its highest point. Once across this bed, the canal commands a large flat running down to the Sabi River for about four miles, all of which can be put under irrigation from this canal, an extent of about 5,000 acres of very fine alluvial soil over 20 feet in depth—the accumulation of centuries.

The present works are capable of irrigating an area of 500 acres on a basis of one watering a fortnight, or some 3,000,000 gallons in 24 hours, but they are capable of being doubled in size at very little cost. The sluice gates and Armco culverts installed were supplied by Messrs. Johnson and Fletcher of Salisbury. The canal is lined with stone for the first 200 yards.

Last season there was little time for more than experimental crops, but these were most successful, a small patch of White Burley tobacco having produced about 1,200 lbs. to the acre of very good quality leaf, and 35 acres of maize yielding 360 bags—this without irrigation and on only 5 inches of rainfall. Much heavier yields are expected now that irrigation is possible, and 200 acres will be put under tobacco this season, whilst 18 flue barns will be constructed with the accompanying grading sheds, etc.

Bee-Keeping in Rhodesia.

By T. SAVORY.

The immediate after-care of the colony can be disposed of in a few lines. Watch the entrance carefully the morning after the swarm has been hived. If the bees are going in and out freely all is well for the time being, but as it may occasionally happen that a colony contains an unusually large number of drones, a lot of these, unable to get through the queen excluder strip, might be blocking up the entrance and cause the death of many of the occupants of the hive owing to lack of air. Should this happen, quickly remove the excluder and draw out with a wire anything blocking the entrance. However, this seldom occurs. If all seems well, watch the entrance occasionally for two or three days, and as soon as any bees are seen carrying pollen, remove the excluder for good, as that is almost an invariable sign that the colony have accepted their new home and the queen started on her life's work of egg laying. In any case it should not remain on a minute longer after making fairly sure that the hive is accepted. It is unfair to the worker bees, who have to scrape through the holes, getting some of the pollen rubbed off their leg baskets, and it delays the inmates in the proper cleaning out of dead bees and other refuse matter from the hive. If by any chance—lack of frames, dummies, etc.—spaces have been left in the hive body, inspect it next morning, and after sending a little smoke in the entrance, remove the lid, fill up with the full number of frames or dummies and close it up. Some new colonies are extremely active in their workings and can easily draw out all the nine or ten frames of foundation in the brood chamber in seven to eight days. It will therefore pay the owner to examine it lightly every three or four days to see how the bees are working, and so to provide them, if necessary, with a second brood chamber of shallow frames.

By so doing he is laying up in his apiary a colony which throughout the winter will not only be amply provided with a store of natural food, but one that will emerge in the early spring months, brimful of workers to store up the proceeds of the first powerful honey-flow of the season, which is really the first and soundest secret of all apiary work. As an example of what our wild Rhodesian bee can do, it may be stated that the writer had one strong colony last June that in twelve days after hiving had drawn out and filled with brood and honey ten deep frames, and another in April that did the nine frames in eight days. Both of these were working in and on their double brood chamber within a fortnight of hiving.

A few items from experience directly touching upon treating new colonies may be of use. Do not be persuaded to use what are called "starters" in the hives, *i.e.*, two or three inch strips of foundation in the frames instead of full sheets; the plan is a cheap and nasty one, like the one of not filling in the full number of frames. When it is known that to make 1 lb. of wax it takes the bees 7 to 15 lbs. of honey to collect, it will readily be seen that, with honey at 2s. to 3s. per lb. and foundation at 5s. 6d. per lb., eight sheets to the lb., the saving when using full frames is very considerable. Cell-building takes time and labour, and as all newly swarmed colonies are provided with much wax on their bodies, if they are able to start work at once on full sheets of foundation, not only are time and work saved, but a larger crop of honey is the result. Another objection to starters is that the workers will be more apt to build drone comb, with the result of much useless drone brood. It is said that the difference in yield of honey when using full sheets and starters is about double. When preparing the frames, be careful to see that the sheets of foundation are firmly fixed to the top and so on to the wires; careless or hasty fixing may easily cause the sheets to drop down in the chamber when the weight of the bees is upon them, causing a tragic mess inside. The sheets should fit well into the frame socket and be firmly kept in place by at least four brads. The spur wheel embedder should then be slightly heated over a spirit flame, and run gently over each wire, with just enough pressure to bed it firmly on to the wires. If these two items are carefully done and the foundation

sheets fit the frame on all four sides, the hive inmates will at once start to fasten it on each side. A full and firm frame makes one that will last under ordinary care for many years of daily usage.

Swarms are often met with in the open veld or bush, and present but little difficulty in handling. If within easy reach, they can be shaken into the trap box and carried home. If out of hand reach, what is known as a "swarm catcher" is used. It is generally a lightly made inverted cone of mosquito netting on a frame of wood, with a cover to drop down by a pull on it of string as soon as captured.

Smithfield Prices.

Messrs. Hart, Harrison & Co., 4 and 5 West Smithfield, London, E.C. 1, kindly supply the following prices obtaining on 12th May:—

London Central Markets.—Beef: Moderate demand, fair supplies of fresh killed and heavy supplies of chilled; prices firmer.

English long sides, 7½d. to 8¾d. per lb.
Argentine chilled hinds, 5½d. to 6d. per lb.
Argentine chilled fores, 2¾d. to 3d. per lb.
Uruguayan chilled fores, 2¼d. to 2¾d. per lb.
Uruguayan chilled hinds, 5½d. per lb.

Fresh Fruit from Producer to Consumer.

By G. W. MARSHALL, Horticulturist.

In the past the rail and cartage charges on fresh Rhodesian fruits restricted the sales to a great extent. The Hon. the Minister of Agriculture and Lands has interested himself in this matter with the view to encouraging the distribution of fresh fruit direct from the producer to the consumer.

Excellent quality and variety of fruit is being grown, and several of the leading Rhodesian growers, acting on the advice of the Horticulturist, are adopting modern packing methods and will thereby be in a position to supply fruit in small quantities direct to the consumer. It is to be hoped that the fruit consumers will take advantage of the opportunities afforded them of securing fruit at reasonable prices.

The cartage contractors in Bulawayo and Salisbury have very kindly consented to reduce their delivery charges from 6d. per package not exceeding 100 lbs. to 3d. per package of 50 lbs. and under. The railage rates on a 25 lb. package of fruit will not exceed 1s. 3d. over the Rhodesia railways, that is if it is consigned by goods train, to which charge must be added 3d. cartage. The total rail and cartage charges will in no case exceed 1s. 6d., which can be considered very reasonable.

Smaller packages of fruit can be sent more economically by passenger train up to certain distances. A 20 lb. package of fruit will cost 5d. up to 50 miles, 9d. to 100 miles, and 1s. to 150 miles distant from the producer. A 30 lb. package could be sent 100 miles for 11d. and 150 miles for 1s. 4d.

From the above it will be seen that small packages consigned short distances will be carried cheaper on passenger trains. Cartage on passenger train consignments is optional, and where the fruit is delivered this charge must be added.

Growers consigning their fruit C.O.D. will have to add 3d. on each consignment up to 10s. in value to cover the low collection charges made by the railways.

Those fruit growers inexperienced in packing and marketing of their fruit can be supplied free of charge upon application to the Horticulturist, Department of Agriculture, with the detailed information contained in the recently published bulletin "Harvesting, Packing and Marketing of Deciduous and Tropical Fruits."

The Campaign against African Coast Fever.

All stock owners in Rhodesia are invited to collaborate with the Veterinary Department in a determined effort to eliminate this disease which has handicapped the pastoral industry since 1921.

Many years ago scientists discovered the cause and the manner of transmission of this disease, and *created a weapon for its destruction.* It remains only for all classes of stock owners in this country to assist the Veterinary Department in its endeavour to make use of this weapon to the best advantage.

To this end all sick and dead animals should be reported to the Veterinary Department and *blood smears and other preparations* should be taken from them and sent to the nearest officer of the Veterinary Department, in order that the first cases of the disease may be detected and an outbreak arrested at its onset.

The transmitter of the disease is the tick, and by destroying the tick the disease can be eliminated.

Therefore all stock owners in the country are urged to wage war upon the tick by regular and *efficient dipping of their stock.*

The officers of the Veterinary Department will at all times and in all places be prepared to advise and assist the stock owner in his attempt to play his part in this campaign.

Farm Homesteads.

(*Continued.*)

By R. H. Roberts, B.Sc. (Eng.),
Assistant Irrigation Engineer.

TYPE III. (Three-Roomed Homestead).

In the last issue the two simplest and most economical types of dwelling were dealt with, the first two of the series of designs of which the third forms the subject of the present article. The original design of this type figured as drawing No. MS. 107, which has now been revised to effect certain improvements (MS. 113).

The object in view has been to produce a moderate-sized house of a permanent nature, more elaborate than the thatched huts of types I. and II., but at the same time reasonable in its cost. Compactness and economy of construction have been achieved by the adoption of a rectangular

type of lay-out, whereby the most efficient use of the space enclosed is secured. The house is divided into two sections: the living rooms in front under a pitched and ceiled roof, and the "service" rooms under a flat roof at the back. This arrangement has the further advantage that the former are separated from the latter by a single door, by the closing of which complete isolation from the native regions may be effected.

The principle of facing the house to the north has been adopted in the design for several reasons. The verandah will be shady in the summer when the sun is in the south, and will receive the winter sun throughout the day. A suggestion that may be found of use, although not actually incorporated in the design on the consideration of extra expense, would be to extend the verandah along the west side. (The extension is shown in dotted lines on the plan.) This would make fuller use of the afternoon sun in the winter, and would also shade the bedroom and kitchen windows from the direct heat of the sun. French casements might then be substituted for the west windows of the second bedroom to give an entrance from the verandah. A similar extension of the verandah along the east side is not recommended, as it would cut off the morning sun; apropos of this it may be suggested that the bathroom window should be built in the east wall instead of the south, or in addition to the latter.

A feature of the design is the provision of mosquito gauze at the back and front of the central rooms, so that in the hot weather a draught of cool air may be passed through the house by leaving the central door open when desired (no draught would exist if this door were closed). Moreover, excellent lighting of the living room is secured by this device. The framing is built at the outside of the wall, so that a small ledge is left inside. The "enclosed stoep" at the back, being mosquito-proof, may be used for a variety of purposes, such as an extra living room, work-room, store-room, etc. The house is therefore really a four-roomed cottage.

A word may now be said on the alterations made to the original design. The verandah has been increased to a width of 8 feet, an improvement out of all proportion to the slight

extra cost. Between the verandah pillars a two foot parapet wall is shown, which, in addition to improving the appearance, will also provide the first step towards the mosquito-proofing of the verandah should this ever be desired. The dimensions of the rooms have been altered both in size and height; the living room has been enlarged to 14 feet square, with a corresponding increase in the length of the "stoep." The height of the main rooms is now 11 feet instead of 10; this represents a very small extra cost, and the comfort and airiness of the rooms are greatly improved. The front fireplaces have been removed from a corner position to that shown, which simplifies their construction; the two flues are led obliquely backward and to the side so that a kink is produced, after which they ascend the chimney side by side. With regard to the windows, it will be noticed that sash windows have been substituted for casements; although possibly æsthetically inferior, they have the great advantage that complete mosquito-proofing may be easily effected by the use of light frames fixed outside. In order to break up the somewhat long front surface of the roof, a small ventilator gable is shown; the inclusion of this feature is, of course, entirely optional. The construction is described below.

As regards the actual building of the house, space does not permit of a full specification for the various operations, and only points of special interest can be noted.

Brickwork.—For strict economy the floors are shown as of brick; to render them proof against the ravages of ants, great care must be taken in the laying of the floors. The rubble fill should be of uniform size and put down in thin layers, each being wetted and thoroughly damped down to avoid any subsequent settlement, a ½ inch layer of sand being spread on top. The bricks are best laid loose and afterwards grouted in carefully with 1—6 cement mortar, the surface being given a ¾ inch coat of 1—4 mortar (1—6 cement mortar should be used for both floors and foundations).

Should a concrete floor be desired, the mix should be 1—3—6, and equal care should be taken with the rubble fill to prevent cracking. The ant course will consist of 26 gauge flat galvanised iron 12 inches wide, laid one course above floor level, as described previously. This

method still leaves the door frames as vulnerable points, and they should be protected by setting them in concrete sills carried up at the sides to ant-course level. Above the ant course the walls are laid in 1—6 lime mortar, pointed in cement mortar 1—4 on outside walls where exposed to weather.

Plastering.—In the schedule of quantities provision is made for plastering inside walls only, ½ inch thick in 1—6 lime mortar. Should it be desired to plaster the outside walls as well, an effective scheme is to leave a strip 2 feet 6 inches high at the bottom of plain brickwork, which is carried out with good face bricks and a course at the top of the strip projecting, say ½ inch, above which the plastering commences.

Lintels.—These are shown as of concrete 1—2—4, which are moulded in position in box frames strutted from below. Those over the larger windows are reinforced with two fencing standards cut to the required length and placed near the bottom of the concrete. (For full description of concrete work, see *Rhodesia Agricultural Journal*, April, 1926.) As an alternative to concrete, brick arches as described previously may be used.

Ceiling.—Ceiling is provided only for the three front rooms, and is nailed with 1½ inch ceiling nails to the under side of the tie-beams and of ceiling joists placed midway between each pair of trusses. Ceiling joists are also placed next each cross wall where no truss exists.

Roof.—The trusses supporting the main roof are spaced about 5 feet apart in the positions shown in the plan. The truss next the main chimney should be set so as just to clear it. At the gables, wall plates should be secured to the sloping brickwork with hoop-iron straps. These wall plates carry the purlins, which may alternatively be strapped themselves to the brickwork.

The joint between the iron on the main roof and that on the verandah and back roof is made on a single purlin, as shown in the section, the upper iron overlapping the lower by 6 inches.

Between the central pair of trusses is fixed a ridge piece of 4½ inches x 1½ inches, and to this is fixed the ridge of the

ventilator gable; from this point run the two valley rafters as shown, and oblique or valley purlins are nailed on each side to receive the valley guttering, which consists of inverted roof ridging.

The verandah roof is supported in front by a 4½ inch x 3 inch wall plate across the pillars; rafters are situated above each pillar and at the mid-points.

Costs.—With the exception of bricks, which are assumed to be of farm manufacture at the rate of 12s. per thousand, the cost of materials used in the building has been estimated from current Salisbury prices, and is approximately £240, to which must be added the cost of cartage and railage. Any estimate of the actual cost of labour in building must necessarily be misleading owing to the widely differing conditions to be met with, and accordingly is not attempted.

FARM HOMESTEAD: TYPE III.

Schedule of Quantities.

Item.	Description and dimensions.	Number or quantity.
Bricks	(a) foundations ...	9,000 nett
	(b) walls	27,000 „
	(c) floors	6,000 „
Building lime	... ...	29 bags
Cement	... ...	36 „
Sand	... ...	34 cubic yards
Broken stone	... ...	1¼ „
Corr. galvanised iron, 24 gauge	6 feet	4 sheets (ventilator gable)
„ „ „	9 „	72 sheets
„ „ „	12 „	24 „
Roof ridging	6 ft. lengths, 18 ins. girth	12 lengths
Flat galvanised iron, 26 gauge	6 ft. x 3 ft., for flashing and ant course	23 sheets
Galvanised roofing screws ...	2¼ ins. long, with lead and iron washers	5 gross
Guttering	O.G. 5 ins. x 4 ins., in 6 ft. lengths	16 lengths
Down piping	3 in. diameter, in 6 ft. lengths	4 „
Air bricks	9 ins. x 3 ins. ...	6
Fencing standards ...	for lintels ...	10
Mosquito gauze	4 ft. wide	23 ft.
„ „	3 ft. 6 ins. wide ...	28 ft.
Stock doors and frames ...	6 ft. 6 ins. x 2 ft. 6 ins.	7
French casement and frame (double)	7 ft. x 3 ft. 6 ins. ...	1
Sash windows	4 light, 15 ins. x 30 ins.	5
„ „	2 „ „ „	2

Timber.

Section.	Item.	Size.	Length.	No.	Total length.
Roof (main and lean-to)	wall plates ...	4½ ins. x 1½ ins.	14 ft. 9 ins.	1	14 ft. 9 ins.
	,, ...	,,	12 ft. 9 ins.	6	76 ft. 6 ins.
	,, ...	,,	12 ft.	2	24 ft.
	,, (gables)	,,	9 ft. 6 ins.	4	38 ft.
	,, ...	4½ ins. x 3 ins.	14 ft. 9 ins.	2	29 ft. 6 ins.
	tie beams ...	4½ ins. x 1½ ins.	15 ft. 6 ins.	8	124 ft.
	rafters ...	,,	9 ft.	16	144 ft.
	,, ...	,,	12 ft.	8	96 ft.
	king posts ...	,,	4 ft. 6 ins.	8	36 ft.
	collars ...	,,	2 ft. 6 ins.	8	20 ft.
	purlins ...	3 ins. x 2 ins.	14 ft. 6 ins.	24	348 ft.
	fascia ...	9 ins.	...	...	105 ft.
Ventilator gable	ridge piece ...	4½ ins. x 1½ ins.	8 ft. 6 ins.	1	8 ft. 6 ins.
	ridge in main roof	,,	5 ft. 6 ins.	1	5 ft. 6 ins.
	rafters ...	,,	,,	2	11 ft.
	,, ...	,,	4 ft.	2	8 ft.
	valley rafters ...	,,	9 ft.	2	18 ft.
	purlins ...	3 ins. x 2 ins.	,,	4	36 ft.
	,, ...	,,	7 ft.	2	14 ft.
	fascia ...	9 ins.	...	...	15 ft.
Verandah ...	wall plate ...	4½ ins. x 3 ins	9 ft.	2	18 ft.
	,, ...	,,	8 ft.	3	24 ft.
	rafters ...	4½ ins. x 1½ ins.	9 ft.	11	99 ft.
	purlins ...	3 ins. x 2 ins.	14 ft. 6 ins.	6	87 ft.
	fascia ...	9 ins.	...	...	62 ft.
Ceiling ...	joists ...	4½ ins. x 1½ ins.	15 ft.	11	165 ft.
	ceiling boards	6 ins. x ½ in.	14 ft.	29	406 ft.
	,,	,,	12 ft.	56	672 ft.
	cornice ...	3 ins.	...	...	166 ft.
Mosquito framing	verticals ...	4½ ins. x 3 ins.	...	...	68 ft. 6 ins.
	horizontals ...	4½ ins. x 1½ ins.	...	...	50 ft. 6 ins.

(To be concluded.)

A Different Type of Barn Construction.

(The following notes are published with the approval of the Tobacco Expert and the Irrigation Engineer. A design for roof ventilation much on the same lines as that described by Commander Knight will be reproduced in the August issue of this Journal. So far as the control of heat is concerned, a similar furnace to that detailed in the accompanying notes was described in our February issue.—Ed.)

The chief points of difference in these barns are the system of ventilation and control of the heat. These are as follows:—

I have ridge ventilation, which is surely the correct type, the object being to remove the hot moist air, which naturally rises to the highest point. These ventilators are four in number in each barn, two on each side, and extend practically the whole length of the ridge, viz., two of 6 feet 6 inches each in a ridge length of 16 feet. They are constructed as follows:—The rafters cross instead of meeting, and project beyond the middle point. This can be obtained on existing barns by straps lengthening the rafters. The bottom ventilators have scuttles leading the incoming air on to the top of the hot flues, more or less on the principle of the hot air muffle of a motor car engine.

So far as control of heat is concerned, the furnaces—of the ordinary size—are fitted with fire bars and doors of ⅜ inch boiler plate hinged and latched, and a 6 inch draught plate which shuts down on to a brick ledge, thus enabling all draught to be excluded when necessary, thereby giving complete control of heat. This is very much on the system of the Sykes furnace, but of far cheaper construction.

The result of this system is that I can afford to run an excessive amount of moisture until the tobacco is fully yellow. I can run my barns up to 115° with maximum saturation, the tobacco literally dripping; then remove the

wet sacks and take out the whole of this surplus moisture in 15 minutes without sponging the tobacco—at the end of the 15 minutes having a difference of 17° or 18° between the wet and dry bulbs.

The following is a typical reading:—

8.0 a.m. 115/114. Tobacco dripping. Take out the wet sacks. The temperature drops a little (1°) while so doing. Open draught plate of furnace; and at

8.5 a.m. 115/113. Open two leeside top ventilators.

8.10 a.m. 116/111. Open four bottom ventilators very slightly.

8.15 a.m. 116/100.

8.20 a.m. 116/98. A difference of 18°.

The tobacco at the top of the barn now has the feeling of a well wrung out wet chamois leather.

From now on I keep the dry bulb steadily rising till in 24 hours it has reached 125° to 130° and the wet bulb has dropped to 94°—96°, and remains steady. If this is done without any sudden violent drops of the dry bulb, I find that in 24 hours from taking out the sacks the top tobacco is well dried in to the midrib and the colour fixed, and no sponging has taken place except possibly by the door and top inspection door, and very little even there. I then raise my temperature 5° every hour and a half, reducing top and ventilation as the tobacco dries out, and by 150° all ventilators are shut.

The only reason I feel this may be a help to other growers is that two experts, Mr. Bass of the U.T.C., and Mr. Jones, Government Tobacco Adviser, have informed me that this system is the best they have seen in this country. My tobacco is being graded by Mr. Reid Rowland, and anyone who cares to see the result of this system can see it there.

I may say my first few barns were not a success, as I was trying to follow the curious directions given in the books on this subject and with very poor results.

I may add that I chart on squared paper a graph of each barn, and have found it of the greatest value in judging the results and arriving at the causes of the same.

R. M. G. Knight.

A Note on the Tobacco Crop of 1926-27.

By D. D. Brown, Tobacco and Cotton Expert.

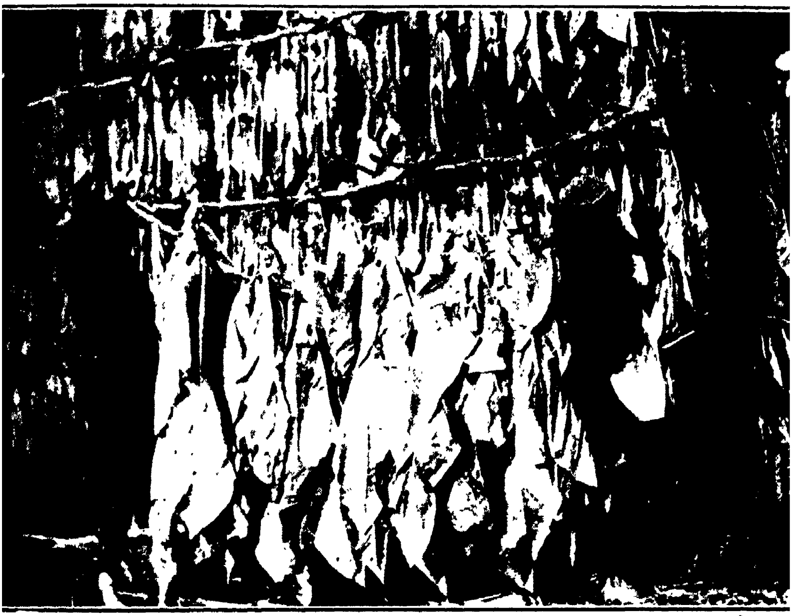
The tobacco crop produced during the season under review has proved, in many respects, to be a noteworthy one. The opening stages of the season were disappointing, the bulk of the crop being transplanted under difficulty owing to lack of suitable rains at the time. Many growers were unable to plant out the whole of their crop until very late in the season, and these late plantings were severely damaged by frost before they reached maturity or could be harvested.

During the growing period the crop was subjected to several prolonged spells of drought. However, in spite of the difficulties experienced by growers, a good crop has been produced, and it is the largest yet harvested in this Colony. The quality of the leaf is good and the average yield per acre promises to be the highest ever recorded in Southern Rhodesia. The number of growers and the acreage planted to tobacco greatly exceed any of our previous figures.

The following tabulated figures are interesting and denote the expansion of the industry during the past few seasons:—

Season.	Number of Europeans on Tobacco Farms.	Virginia.			Turkish.		
		No. of Acres.	Yield in lbs.	Acre Yield in lbs.	No. of Acres.	Yield in lbs.	Acre Yield in lbs.
1922-23	388	7,758	2,540,942	327	1,296	269,839	208
1923-24	356	7,001	3,426,390	489	1,002	452,070	451
1924-25	336	7,550	1,987,382	263	891	418,522	469
1925-26	672	13,160	5,313,186	404	755	346,623	459
1926-27*	1,600	32,614	17,240,000	528	600	180,000	300

* Note.—The figures relating to yields of tobacco in 1926-27 are only approximate, as the crop has not yet been fully handled and sold, and until such time as the whole crop has been disposed of it is only possible to furnish a very rough estimate of the quantity of tobacco produced this season.



White Burley tobacco grown extensively in the Odzi and Umtali districts for air curing. Two natives carrying six plants. In background, air curing barn. Westacres, Odzi (Major Mungle).

A leaf of White Burley tobacco 45 inches long and 26 inches broad, grown at Major Mungle's farm, Westacres, Odzi.

From the above table it will be seen that the increase in acreage and yield as between the 1922-23 season and the present season is about four times and seven times respectively.

The crop this year has been practically free from bacterial disease, while insect pests have given little trouble. "Mildew" or "white mould" increased in many crops towards the end of the season, and several crops were severely affected by "red rust" (*macrosporium longipies*).

A feature this season has been the number of new growers and the number of prospective growers who are undergoing tuition on the farms of old established tobacco growers preparatory to taking up land of their own. To these new growers particularly it might be well to draw attention to the fact that this season has proved to be exceptionally favourable for the production of tobacco. A conservative view of next season's prospects will lead to less disappointment probably than ideas based on the results of the present season. It will be an unsound principle to gamble in tobacco on the strength of what has been achieved this year; tobacco growers should plan to plant out only the acreage which the available capital, labour supply and building accommodation will allow.

The planting of large acreages does not always ensure a big profit to the grower on the year's working. An individual tobacco grower undertaking an excessive acreage usually produces quantity, but very little quality. It does not require much calculation to find out that the average price obtained is seriously affected by the production of a fair percentage of low grade tobacco. Every effort should be made to produce quality rather than quantity; the more the total output of our tobacco increases, the greater will be the necessity to endeavour to produce leaf of good quality. The field of competition has already become considerably wider during the past few years, and as time goes on it is likely to be still further increased, so that Rhodesian tobacco will meet with keen competition and quality will be a very important factor in the sale of our leaf.

For the information and assistance of growers, a general outline of some of the common mistakes made this season is given below:—

Lack of topping, priming and suckering.
Planting acreage in excess of barn accommodation.
Unsuitable or inadequate storage room for the cured leaf.
Unsuitable grading facilities.
Harvesting mixed leaf and unripe leaf.
Crowding tobacco into the barn.
Bulking the tobacco in high condition.
Baling mixed grades in the same bale of tobacco.
Pastelling the leaf.

In a season like the present one it has been advisable to top the plants a little higher than usual, but neglect to top the tobacco has in many cases caused a large percentage of small leaf and lack of body in the cured tobacco.

In many fields which were badly primed or were not primed at all the crop has been seriously affected by "white mould."

The crop on many farms was allowed to produce too many suckers. When there is any likelihood of second growth or the leaf becoming too coarse, it is sometimes helpful to allow a few suckers to grow out at the top of the plant, but to have them all the way down to the ground is not recommended.

Much loss has been sustained through inadequate barn accommodation for this season's crop, and if good yields are obtained in future years the ratio between acreage and barns will have to be reduced. Even ten acres to one 16 ft. x 16 ft. barn will be on the high side. A great deal of the "sponging" was caused through saturating the earth floors in barns, which gave rise to an excessive humidity at a stage in the curing when it was highly undesirable. Brick or cement floors are best in the long run.

During climatic conditions such as obtained during this season, the yellowing of the leaf was best carried out at higher temperatures than normally; this, of course, applies only to the earlier part of the season, when the tobacco contained a great deal of moisture. Excessive sponging was prevented also by opening the top ventilators at 95° F. instead of 110° to 115° F., which is the usual temperature attained before ventilating the barn under normal conditions. Through inexperience a large quantity of tobacco was har-

vested too green, and when mixed with ripe leaf in the barn the curing was unsatisfactory, the usual result being the sponging of the ripe tobacco and a big percentage of green colour in the unripe leaf. In the hope that they could cure the whole of the crop, some growers overcrowded their barns, and owing to their filling them beyond the proper capacity, a quantity of tobacco was damaged by "pole sweat."

Again in some instances the accommodation for storing the cured leaf was insufficient and gave rise to the hasty erection of temporary buildings in which to store the overflow from buildings previously erected. These temporary buildings were mostly made of "pole and dagga" or grass; consequently the tobacco turned mouldy through the pole and dagga walls being very wet, especially in cases where the bulks were built hard up against the wall. The all-grass construction allows the tobacco to dry out too quickly, besides being specially liable to ignition.

The question of grading on the farm has apparently not received due consideration by some growers, as in some instances there are either no grading sheds or else an unsuitable building has been set aside for the purpose. Grading can only successfully be carried out in a properly constructed building with proper lighting and handling facilities. A somewhat general tendency to rely on the grading being done anywhere but on the farm is to be deprecated, and if persisted in will only lead to congestion in the few commercial grading warehouses already in existence. A new grower having no facilities may well send his crop to be graded in a commercial grading establishment, but as soon as he becomes established the grading should be treated as part of the farm routine and arrangements made for grading on the farm.

When bulking or baling tobacco the leaf should not be flattened out or "pastelled." On many farms the tobacco has been bulked or baled in "high condition" or when containing too much moisture. A bale of tobacco should contain only leaf of the same grade.

In conclusion, attention is drawn to articles previously published in the *Rhodesia Agricultural Journal*, and it is suggested that many of the mistakes enumerated above would have been prevented had more attention been paid

to the instructions contained therein. The attention of tobacco growers has been called to the errors made this year in no spirit of criticism, but with the hope that an error once realised will not be unwittingly repeated.

Review.

PRINCIPLES AND PRACTICE OF HORTICULTURE.

The University Tutorial Press of Burlington House, Cambridge, have recently published a volume under the above heading. The author is Mr. A. S. Galt, Lecturer and Organiser in Horticulture, University of Leeds, and Lecturer in Horticulture, Leeds Training College.

The work covers 240 pages of valuable information dealing with soils, manuring and cultivation in regard to vegetable and deciduous fruit growing. There is also much useful information contained in the appendices.

Although the work is written primarily for a country with a temperate climate, the volume will be of great value as a text book for agricultural colleges and schools, and every student should find space on his book shelf for a copy.

Under our tropical and sub-tropical conditions it would be unwise to apply some of the recommendations contained therein—this is chiefly to be found in chapters 22 onwards. Here our system of pruning would differ; also the varieties of fruits recommended would be unsuitable owing to the climatic differences. The book, however, contains sufficient information of value which can be applied to Rhodesian conditions to enable us to recommend its purchase.

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Ploughing by Tractor.

In reply to "Tractor's" enquiry in the May issue, the Fordson will not economically pull a three-furrow disc plough in any soil. It can be done, but the cost would be high—probably over 12s. per acre. I have just been trying out the new type of push plough with the Fordson, and find that it will easily push a three-furrow disc, the cost being about 4s. 6d. per acre in new lands and 4s. in old. This type of plough would plough heavy black vlei. With heavy black vlei, unless in an extremely dry condition, the first ploughing should be done with a mouldboard plough. Some vleis can be almost irretrievably damaged by ploughing with the wrong type of plough and at the wrong time.

The cost per acre, using a two-furrow mouldboard plough, in old lands, should not exceed 6s. per acre. My own costs are lower than this, but I have been using a Fordson for over six years. These costs are for Macheke district; the extra railage on paraffin and oil to Plumtree might bring the cost slightly higher. The cost of tractor working in Rhodesia is greatly influenced by the knowledge of the operator and by the implements used. Tractors are very reliable, but many tractor implements, although successful in other countries, are not suited to Rhodesian conditions.

I am, etc.,
A. W. V. Crawley.

Dawn Ranche,
Macheke,
17th June, 1927.

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Commercial Aspects of Tobacco Growing.

I am obliged to you for publishing my letter on the commercial aspects of tobacco growing, but I much regret that you have not published an article in the Journal dealing, however broadly, with the matter.

Mr. Brown's footnote to my letter is really of very little assistance.

I had hoped that you would have been able to obtain information from business people actively interested in the growing of the crop and able to speak with authority.

Mr. Brown, as the Government technical expert, can hardly be expected to be "au fait" with the actual commercial side of the industry. I may say that I have seen tropical products grown in other parts of the world where it was necessary for the planter to keep most accurate accounts to enable him to judge how his operations were turning out.

Cost of all field operations was worked out; average yields per acre were all worked out in the different grades, and weekly market reports were forwarded from London to each grower in the season, showing what price each lot from each particular estate had fetched that week, each estate being designated by an estate name, or trade mark, if you like. This enabled a grower to see what his neighbours were getting in the open market.

Any figures required by the novice as to cost of planting, handling, preparing for export, warehousing, agents' charges, freight, etc., were readily obtained and cheerfully furnished by the growers' central organisation.

The crops I refer to were just as much at the mercy of the seasons as tobacco here; capabilities of different growers were just as variable as here, and costs of production were more difficult to ascertain, as different races were employed as labourers under highly different scales of pay, which does not apply here. In spite of all this, perfectly reliable figures, within a margin, were readily ascertainable to help the newcomer at all stages of his crop.

I suppose I shall have to go to America now, or to Havana, for the particulars I require, which seems rather strange when tobacco has been grown in this country for the last fifteen years.

I am, etc.,

G. A. EVANS.

14, Strachan's Buildings,
Salisbury,
24th May, 1927.

P.S.—Publish this letter if you think it is of the slightest interest to anyone; otherwise not, at your discretion.

[We regret we can add nothing to what the Tobacco Expert has stated. We shall, however, be pleased to publish any reliable data our readers can send us relating to this subject.—Ed.]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Tobacco Preference.

I know little of tobacco growing, having only been in the country six weeks, but I do know something of tariffs and economics. The main object of the Imperial Government in granting preference to Empire-grown tobacco was to encourage smokers to ask for it, as it was thought it would be sold at 1d. or 1½d. per oz. less than other tobaccos. This in turn would give a fillip to Empire-grown tobaccos. The growers themselves and the manufacturers are not supposed to derive any more benefit than is indicated above from the preference, and the sooner the growers learn not to expect to benefit in the shape of an additional so many pennies per lb. through this preference the better. That there is a preference at all is something to be thankful for, but the grower should devote himself to turning out more and better tobacco than he is doing to-day, so that when the time comes (as it probably will) when Empire-grown tobaccos have to compete on equal terms with other tobaccos, our own products will be enquired for on their own merits and not on account of adventitious aid.

When our production in point of quantity is worthy of consideration it will be time enough to see manufacturers and the Empire Marketing Board with a view to giving Rhodesian tobacco more prominence in the public eye. The proportion to the whole of South African tobacco imported into Great Britain last year was only one-half per cent., or 1 lb. in 200 lbs. This unseemly scramble for coppers out of the preference is unsound and misses the mark entirely. The preference is a free advertisement, the gift of Mr. Winston Churchill, and should be regarded only from this standpoint.

I am, etc.,

GEO. REVILL.

Pembi,
Concession,
19th May, 1927.

[A rebate of one-sixth of the duty was first granted in 1919, the object being to encourage tobacco production in the Empire. The coppers referred to by our correspondent represent a considerable sum on the quantity of tobacco which will be exported this year.—Ed.]

Movements of New Settlers.

The following information is sent to us by the Department of Lands for publication:—

New Arrivals.—E. Sarif and W. L. Cousins.—Arrived from Union on 3rd May on tour of inspection.

E. H. Berry.—Arrived from Great Britain on 3rd May, and is now with Mr. A. H. Austin, Baddeley.

J. Young and T. Young.—Arrived from England on 4th May, and are undergoing a course of tobacco grading at the Tobacco Warehouse, Salisbury.

G. St. C. Forbes.—Arrived from Union on 5th May, and proceeded to his brother, D. C. Forbes, Arcturus.

N. Greenslade.—Arrived from England on 9th May, and proceeded for training to Mr. Everard, Inyazura.

R. Charles.—Arrived from England on 11th May, and is now with Mr. D. A. Vaughan-Clark, Arcturus.

G. L. Stebbing.—Arrived from England on 11th May, and is receiving training on Mr. G. M. Huggins' farm Craig, Salisbury.

J. Jacob.—Arrived from England and proceeded for a period of training to Mr. H. S. Thomas.

T. C. Finlay.—Arrived from England on 13th May, and was placed for training with Mr. F. Pickering, Sinoia.

G. W. Parnell.—Arrived from England on 13th May, and is now with Mr. C. Peake, Dalston, Lomagundi.

D. D. Pearce.—Arrived from England on 13th May, and joined his parents on Lilburn, Mazoe.

J. A. M. Laing.—Arrived from England on 13th May, and is now undergoing training with Mr. H. F. Paige, Bindura.

H. Steyn, D. Steyn, J. P. Davies and Kriel Bros.—Arrived from Union on 17th May on tour of inspection.

Messrs. Doliette and Volpi.—Arrived from Italy on 20th May on tour of inspection.

J. Anderson.—Arrived from England on 20th May on tour of inspection.

L. R. Bredell.—Arrived from Union on 20th May, and proceeded to inspect land in the Inyanga district.

Capt. B. S. Cherry.—Arrived from England on 20th May, and has since joined Capt. C. R. L. English on Lushington, Marandellas.

Mr. and Mrs. G. E. Loomes.—Arrived from England on visit to Mr. Loomes, Glen Tor, Salisbury.

R. G. Wilde.—Arrived from England on 22nd May, and is now undergoing training on Messrs. Wilde & Caldicott's farm, Usaka, Msonneddi.

Capt. and Mrs. D. Cloete.—Arrived from England on 23rd May, and have been viewing land in the Hartley and Salisbury districts.

B. St. J. Atkinson.—Arrived from England on 25th May, and is now undergoing training on Mr. G. Fleming's farm, Gilston, near Salisbury.

O. P. Johnstone.—Arrived from England on 26th May on tour of inspection.

S. H. Charrington.—Arrived from England on 30th May, and is visiting Mr. C. D. Wise, Mazoe.

C. Tompsett.—Arrived from England on 28th May, and has proceeded to East Clare Estate, Que Que.

Mr. and Mrs. H. M. Laskie and Mr. and Mrs. C. F. Armstrong.—Arrived from England on 31st May, and are staying in Salisbury for the present.

Southern Rhodesia Veterinary Report.

March, 1927.

AFRICAN COAST FEVER.

UMZINGWANE DISTRICT.—No fresh outbreaks. The mortality during the month was as follows:—Essexvale Estate, 264; The Range, 9; Woodlands, 1; Emangeni and Adams, 2; Inyankuni, 1; Limerick and Plot 82, 1; Swaithes, 1.

MATOBO DISTRICT.—A fresh outbreak occurred on the Matoppo Block within the guard area; one animal affected. The mortality during the month was as follows:—Malaje, 130; Wenlock Block, 5; Matoppo Block, 1; omitted from previous month—Malaje, 42.

UMTALI DISTRICT.—No fresh outbreaks. During the month ten head were destroyed on suspicion at Zimunya's Reserve, in three of which African Coast Fever was confirmed microscopically.

GWELO DISTRICT.—No fresh outbreaks. Two deaths on the infected farm Clearwater.

CHARTER DISTRICT.—Ten head died in the infected herd on the farm Wildebeestlaagte. On the adjoining farm, Hartebeestlaagte, one case occurred in a herd which is dipped at the Wildebeestlaagte tank.

ANTHRAX.

One case oocurred at a kraal in the Ntabezinduna Native Reserve. The infected and in-contact herds were vaccinated.

HEARTWATER IN CATTLE.

A few cases occurred in the West Nicholson and Gwaai areas.

TRYPANOSOMIASIS.

Investigation into a number of deaths amongst cattle on the farm Kardia, Lomagundi district, showed that trypanosomiasis was the cause. Two head of cattle died on the farm Mount Selinda, Melsetter district.

EPHEMERAL FEVER (THREE-DAY SICKNESS OF CATTLE).

Reported as prevalent in most districts of the Colony.

HORSE-SICKNESS.

The following mortality was reported:—Bulawayo, 4; Charter, 4; Selukwe, 1; Victoria, 5; Mazoe, 3; Mrewa, 1; Marandellas, 1; Hartley, 1; Salisbury, 1; Rusape, 1.

IMPORTATIONS.

From Union of South Africa.—Bulls, 29; heifers, 4; sheep, 801; horses, 12; mules, 104; donkeys, 308.

EXPORTATIONS.

To Union of South Africa:—For consumption in Union, 135; for overseas export, 1,837. To Belgian Congo:—2,375. To Portuguese East Africa:—Slaughter, 50; trek, 34. Miscellaneous:—To Belgian Congo: Pigs, 371.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

MAY, 1927.

Pressure.—The mean barometric pressure over the country was above normal, varying from 0.045 in. above normal at Mazunga to 0.008 in. above normal at Salisbury. The pressure was generally higher in the south.

Temperature.—During the month the mean monthly temperatures were below normal, varying from 5.0° F below normal at Riverdene North to 0.5° F. above normal at Essexvale.

The mean day temperatures were about normal, varying from 4.3° F. above normal at Essexvale to 4.9° F. below normal at Riverdene North.

The mean night temperatures were below normal, varying from 5.4° F. below normal at Juliasdale to 1.0° F. below normal at Shamva.

Humidity was generally below normal, varying from 16 per cent. below normal at Fort Victoria to 1 per cent. below normal at Umtali.

Heavy frost was recorded over the greater part of the country on the 14th of May and the succeeding days; the lowest temperature on grass was 18° F. at Bulawayo, which is equivalent to 14° of frost.

The following stations recorded rain during the month:

Zone A:—

Bulalima-Mangwe—	
Solusi Mission	.20
Nyamandhlovu—	
Gwaai Reserve	.17
Nyamandhlovu Railway	.11

Wankie—	
Sukumi	.06
Zone B:—	
Bulalima-Mangwe—	
Retreat Farm	.67
Riverbank	.64
Semokwe Reserve	1.06
Tjompani	.52
Chibi—	
Nuanetsi	.02
Gwanda—	
Lamulas	.01
Limpopo	.07
Makalali	1.51
Mannantji	.82
Mazunga	.96
Mpande	.98
Mrandas	.99
Mtetengwe	.14
Tuli	.26
Insiza—	
Drumbulchan Estate	.48
Inyezi	1.40
Scaleby	.40
Wanezi Mission	.91
Matobo—	
Holly's Hope	.06
Matopo Mission	.12
Umzingwane—	
Heany Junction	.10
Zone C:—	
Lomagundi—	
Between Rivers	.19
Dalston	.17
Darwendale	.05
Devonia	.70
Kenidia	.31
Mica Field	.15

Mpandeguta	.05
Romsey	.09
Sipolilo	.08
Umvukwe Ranch	.51
Zebra Vlei	.09
Salisbury—	
Ardbennie	.05
Bromley (Randhurst)	.14
Bromley Store	.04
Cleveland Dam	.02
Forest Nursery	.20
Salisbury Gaol	.05
Salisbury Agricultural Department ...	.22
Western Commonage	.03
Zone D:—	
Inyanga—	
Juliasdale	.04
Marandellas—	
Fault Farm	.33
Mazoe—	
Bindura	.45
Chipoli	.18
Citrus Estate	.37
Donje	.92
Glen Divis	.68
Honta	.33
Kilmer	.69
Kingston	.73
Maienzi Farm	.87
Mazoe Dam	.29
Ruia Ranch	.56
Shamva	.22
Teign	.71
Virginia Estate	.73
Volynia Ranch	.22
Woodlands	.29
Mrewa—	
Maryland	.12
Montclair	.30
Nyaderi Mission	.75

Salisbury—	
Arcturus	.11
Chindamora Reserve	.03
Goromonzi	.39
Kilmuir	.06
Meadows	.28
Vainona	.13

Zone E:—

Bikita—	
Native Reserve	.76
Pamushana Mission	.29
Chibi—	
Lundy	.08
Chilimanzi—	
Driefontein	.03
Makoni—	
Kairidzi	.08
Monte Cassino	.15
Tablelands	.07
Whitgift	.02
Marandellas—	
Macheke	.10
Melsetter—	
New Year's Gift	.17
Ndanga—	
Bangala Ranch	.78
Doornfontein	.42
Marah Ranch	.35
Zaka	.68
Umtali—	
Argyle	.04
Embeza	.20
Fern Valley	.06
Mountain Home	.08
Sheba	.20
Stapleford	.15
Transsau Estate	.07

Victoria—	
Chevedon	.27
Clipsham	.04
Gokomere	.08
Miltonia	.08
Morgenster	.42
Riverdene North	.09
Salemore	.33
Silveroaks	.12
Tichidza Mission	.60

Zone F:—

Melsetter—	
Chikore	.10
Lettie Swan	.57

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	July	August
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	9	13
Banket Junction	Banket Hotel	F. Potts	1	5
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	28	25
Bindura	Bindura Farmers' Hall	W. E. Fricker	9	13
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	6	3
Bubi	Queen's Mine	E. C. Gaudin	12	9
Chakari	Various farms	L. T. Tracey	21	18
Chatsworth	Makowries Farm	A. W. White	2	6
Daisyfield	Somabula (July), Daisyfield (August)	L. E. Edwards	9	20
Darwendale—Trelawney	Various farms	B. Theck	13	10
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	9	13
Enterprise	Farmers' Hall	John Johnstone	4	1
Essexvale	Essexvale	C. Geneve	17	21
Felixburg—Gutu	Chindito (July), Ferndown (August)	C. L. Burrows	9	13
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	5	9
Gadzema	Gadzema	G. M. Leahy	10	14
Gatooma	Speck's Hotel	C. M. Davenport	16	20
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	4	1
Greystone	Quarrie Farm	P. J. van der Walt	9	...
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	14	11
Inyazura	Inyazura	Major Tulloch	1	5
Lalapansi	Lalapansi	Edmund Chapman	9	13
Lomagundi	Sinoia	F. W. Robertson	8	...
Lomagundi West	Various farms	E. Morton	10	28
Macheke	Macheke	M. J. Palmer	9	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	3	7
Makwiro	Makwiro	F. H. Howard	15	19
Makoni	Rusape	—. Munch	9	13

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	1	5
Marandellas, Southern	Various farms	D. J. Gale	6	3
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	8	12
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A. Carnegie	14	11
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	16	20
Mazoe (Concession)	Concession Hotel	Frank Allen	12	9
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	13	10
Melsetter	Court House, Melsetter	Dr. Rose	14	11
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	13	10
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	30	27
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	1	5
Nyamandhlovu	Nyamandhlovu	R. D. McLean	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	2	6
Poorte Valley	Various places	D. Wilson	16	20
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	16	20
Salisbury South	Various farms	P. Linton	27	31
Selukwe	The Hotel, Selukwe	W. T. Simpson	1	5
Shamva	Shamva Hotel	E. Butler	21	18
Two Rivers Farming Association	Various farms	W. L. Parsons	9	13
Umboe (Branch of Lomagundi F.A.)	Various farms	A. J. Hawkes	...	13
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	16	13
Umtali	Drill Hall, Umtali	A. Howat	7	4
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	8	12
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	13	10
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Imokilly Fenn...	Shorthorn	4,681.25	...	239	J. Bazeley, Heany Junc.
Daisy ...	do	3,514.75	...	213	do do
B. Duchess ...	do	4,296.75	...	201	do do
B. Emma ...	do	2,300.00	...	146	do do
Eileen Dairymaid	do	1,846.25	...	104	do do
B. Busie ...	do	2,004.75	...	125	do do
Yellow Woods Rita	do	2,662.25	...	119	do do
Yellow Woods Rachel	do	1,715.00	...	98	do do
Suzannah ...	do	4,809.70	189.32	329	G. Cooper, Essexvale
Zazkins ...	do	4,607.00	195.48	323	do do
Endor ...	do	3,565.40	127.02	292	do do
Key ...	do	3,359.90	127.72	290	do do
Mary ...	do	3,806.30	160.73	300	do do
Mooi ...	do	3,706.40	138.51	296	do do
Rosey ...	do	3,722.10	120.77	298	do do
Betta ...	do	2,813 30	122.11	211	do do
Flora ...	do	2,622 30	79.71	171	do do
Pepper ...	do	2,284.30	111.60	135	do do
Bella ...	do	2,042.60	67.89	132	do do
Rosebud ...	Red Poll	5,424.00	...	252	M. C. Myers, S. Marandellas
Daisy ...	do	5,632.00	...	252	do do
Rambler ...	do	4,870.00	...	231	do do
Poppy ...	Friesland	2,768.00	...	120	R. Philip, Arcturus
Daffodil ...	do	1,489.25	...	60	do do
Carnation ...	do	893.50	...	30	do do
Palm Tree Lady	do	7,008.00	294.59	322	J. S. Struthers, Sinoia
,, Eileen	do	6,184.00	306.37	315	do do
,, Beatrice	do	5,868.00	249.77	287	do do
,, Violet	do	6,845.00	281.54	273	do do
,, Pearl	do	4,521.00	234.92	245	do do
,, Laura	do	4,686.00	194.32	245	co do
Cavers Waterpas	do	4,931.00	184.42	245	do do
Palm Tree Molly	do	4,743.00	222.53	245	do do
,, Rosey	do	3,934.00	166.49	224	do do
,, Noonie	do	3,900.00	170.88	217	do do
Phœbe ...	do	5,012.00	183.70	307	R. R. Sharp, Redbank
Buttercup ...	do	6,020 00	206.10	252	do do
Anemone ...	do	5,517.00	199.10	280	do do
Zoe ...	do	5,873.00	196.20	245	do do
Pam ...	do	4,116.00	141.30	210	do do
Katisha ...	do	4,326.00	144.10	203	do do
Primrose ...	do	3,815.00	156.40	174	do do
Lady Jane ...	do	4,033.00	146.90	162	do do
Harlen's Kransje	do	7,098.25	225.68	300	W. R. Waller, Salisbury
Harlen's Primrose	do	5,807.25	214.87	300	do do

RHODESIAN MILK RECORDS (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Harlen's Model	Friesland	9,998.00	322.95	300	W. R. Waller, Salisbury
MelroseFrederika	do	6,450.75	240.31	240	do do
Wolseley Josephine	do	6,412.00	238.05	270	do do
Dunoran Nona	do	7,045.75	228.26	180	do do
Dunoran Pearl	do	6,577.25	225.00	180	do do
H.H. Iris ...	do	3,579.75	124.02	180	do do
Harlen's Dainty	do	6,743.00	232.53	180	do do
Bodlonfa Elsina	do	6,861 25	247.07	180	do do
Harlen's Quest	do	2,936 00	111.63	120	do do
Harlen's Query	do	2,497.75	90.93	60	do do
W. Rika Albert	do	2,162.75	77.83	60	do do
Wolseley Artina	do	1,203.75	...	60	F. Zeender, Insiza
Wolseley Vera II.	do	1,563.25	...	60	do do

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	...	...	112	...	...	884
March ...	135	1,837	...	2,375	...	...	50	34	...	4,431
April ...	106	2,574	...	1,440	...	...	28	...	...	4,148
May ...	205	3,458	...	1,299	...	...	118			5,080
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Mid-season oranges should be harvested and marketed this month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

CROPS.

Maize harvesting will continue. Seed maize should be tipped and butted and hand shelled. The butt grains can be utilised if planting is to be done by hand. Where the maize stalks are fed off on the land, the remaining stalk and roots—as the lands become cleared—should be raked up and burnt. Dhal seed is now ripe, and may be harvested by cutting the entire plant a foot above the ground or by reaping the seed-bearing branches.

Ploughing should continue wherever possible, and every attempt should still be made to break down the rough clods.

Beyond watering, crops under irrigation require little attention. Where this troublesome weed is present oats and other winter cereals may be weeded of Drabok or Darnel grass (Lolium temulentum). Care should be taken not to over-irrigate any of the lands.

If succulents in the form of pumpkins and cattle melons have been fed during the two preceding months, silage may now probably become necessary, and the first pit will perhaps be opened.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions,

from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful. During the winter months it is usually quite possible to keep the evening's milk in a comparatively fresh and sweet condition. This is best achieved by placing the milk outside the dairy overnight and exposing it to the atmosphere. The milk should preferably be placed in a bath and covered over with cheese cloth, butter muslin or mosquito gauze netting.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July.

Onions suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fire guards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or mealies, if the supply of eggs is to be continued, for they need most of the food that previously went to manufacture eggs, to keep up the body heat. A certain amount of shelter is also necessary to protect them from the cold winds that we usually get in July. Grass wind breaks about 3 feet high on the windward side of the run are sufficient.

Remember that no chickens should be hatched after August; those that are take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable.

Each month the young stock should be gone through and graded; anything that does not promise to be good should be got rid of. We want quality rather than quantity.

As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become run down, and infertile eggs and weak chicks will be the result. Good hatching and strong healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor. Dairy cattle will require heavy feeding now, and if plenty of roughage is available, cows in milk will do better if kept in for a while on cold mornings and turned out only after the warmth of the sun is felt.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

Notes from the "Gazette."

"Gazette" Date.	*Items.*
	AFRICAN COAST FEVER.
	Victoria Native District.
27.5.27.	Government Notice No. 280 declares the Victoria Commonage to be an area of infection.
	Gwelo Native District.
10.6.27.	Government Notice No. 324 amends the guard area around the farm Clearwater and cancels Government Notice No. 660 of 1926.

Umtali Native District.

10.6.27. Government Notice No. 325 amends the guard area and cancels Government Notice No. 219 of 1927.

Charter Native District.

17.6.27. Government Notice No. 328 reduces the guard area and cancels Government Notice No. 250 of 1927.

GAME LAW CONSOLIDATION ORDINANCE, 1906.

27.5.27. Government Notice No. 281 authorises the destruction of all game except elephants in certain areas of the Wankie, Sebungwe and Bubi districts, by such persons as may be approved by the Minister of Agriculture and Lands.

CATTLE CLEANSING ORDINANCE, 1918.

27.5.27. His Excellency the Governor-in-Council has been pleased, under the provision of section 16 of the "Cattle Cleansing Ordinance, 1918," to frame the following regulations for the better carrying out of the objects and purposes of the said Ordinance:—

1. All owners of cattle on native reserves, Crown lands and on areas controlled by municipal councils, town or village management boards, and all owners of cattle who do not possess dipping tanks, shall keep a record in the form of the Schedule attached hereto of all cattle in their possession.

2. Such record shall be produced by the owner for inspection when required by an official of the Native Department, Inspector or member of the Police Force.

3. The person in charge of dipping tanks where such cattle are dipped shall enter on such record the date of each dipping, together with the number of cattle dipped. (G.N. 278.)

SCHEDULE.

Cattle Cleansing Ordinance, 1918.

Name of cattle owner..

Residence ....

No. of cattle ....

Where dipped ....

Date of dipping.	No. of cattle.	Signature of person in charge of dipping.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 388. Kudzu Vine, by H. G. Mundy, F.L.S.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 428. The Sweet Potato, by J. A. T. Walters, B.A.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 462. Hay-making in Rhodesia, by C. Mainwaring.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agr., F.L.S., Chief Agriculturist.
No. 504. Castor Oil, by Guy A. Taylor, M.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 552. Mixed Farming in Matabeleland, by Gordon Cooper.
No. 557. Selection of Virgin Land for Arable Farming, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 571. A Farmers' Calendar of Crop Sowings, by C. Mainwaring.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.

Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.

No. 564. A Maize Rotation Experiment, by A. R. Morkel.

No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.

TOBACCO.

No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.

No. 623. Report on Experiments at the Tobacco Experiment Station, Salisbury, Seasons 1924-25 and 1925-26, by A. C. Newton, B.Sc.

No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.

No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.

No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.

No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.

No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.

No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.

No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.

No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.

No. 496. Statistics of Live Stock and Animal Products for the Year 1923, by A. Borradaile Bell.

No. 502. Winter Crops, 1923, by A. Borradaile Bell.

No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.

No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.

No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.

No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.

No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.

No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.

LIVE STOCK.

No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.

No. 227. An Experiment in Beef Production, by R. C. Simmons.

No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.

No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.

No. 336. Butchering and Flaying.

No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.

No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part IV., by R. C. Simmons.

No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.

No. 392. Memorandum on the Cattle Industry of Southern Rhodesia, 1921.

No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 448. The Cattle Industry.

No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 469. Hand-Rearing of Calves, by T. Hamilton, M.A., N.D.A., N.D.D.

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Mr. Amery's Visit.—It was a happy circumstance which enabled Mr. Amery, Secretary of State for Dominion Affairs, to accept the invitation to open the Salisbury Show. He was thus able to see for himself the wide range of farming commodities which the Colony can produce and to mark the progress which the agricultural industry is making. Mr. Amery made the acquaintance of many farmers and officials of the Government and missed no opportunity of becoming familiar with existing conditions. Although his stay amongst us was all too brief, yet he made such use of his time that he was able to acquire a full knowledge of the system of agriculture practised here and a close insight into the prob-

lems which confront the farmers of this Colony. Mr. Amery's speech at the opening of the Salisbury Show was reported verbatim in the daily Press, and we advise all our farmers to make a point of reading it. The desire of His Majesty's Government to foster Imperial trade and to promote Empire development and Empire settlement is one that will meet with a ready response from the farmers of Southern Rhodesia. The message of goodwill and encouragement which Mr. Amery brought us has given the liveliest satisfaction throughout the Colony and will serve as an inspiration to further endeavour.

We have already acknowledged our deep gratitude to the Imperial Government for the granting of a rebate of the tax on Colonial tobacco entering the United Kingdom—a concession which is exercising a very important influence in the development of this Colony—and now we are promised further benefits by His Majesty's Government. Mr. Amery assures us, through the medium of the Empire Marketing Board, that financial assistance will be available in the form of assisted passages for pedigree stock purchased in the Old Country. From the 1st November quarantine stations will be established at various centres in Great Britain, so that whatever the conditions may be, cattle may, after a period of isolation, be exported overseas. This will have a most important bearing on the development of the cattle industry of this Colony. Our greatest need at the present time is good bulls for the improvement of our herds, but unfortunately there has been considerable difficulty in procuring them. We feel sure that this pronouncement will be received with the utmost gratification by stock owners in this Colony. Mr. Amery further intimated that the Empire Marketing Board would be prepared to consider contributing financially towards the expenses of conducting special research into East-Coast Fever. This disease has been with us for many years, and although it has lost much of its old terror, yet its existence is having a serious retarding effect on the development of the pastoral industry. There is much to be learnt in regard to the disease, as reference to the article which the Director of Veterinary Research contributes to this issue of the Journal will show. A concentrated effort to elucidate some of the problems which have baffled our scientists will be more than welcome. The remarks of our

eminent visitor about the importance of agricultural research and the benefits realisable from the pooling of information will be endorsed by those engaged in this work in this Colony. Mr. Amery's reference to the sending out of settlers from the Old Country will make a special appeal to the farmers of this Colony. We know the splendid work which is at present being done in this respect, and this further indication of future effort will give the greatest satisfaction to those who are helping to build up this corner of the Empire.

It is a matter for satisfaction that the Salisbury Show was such a success, and all concerned are to be congratulated upon the result achieved. That it impressed Mr. Amery very considerably we have reason to believe, and we trust that he will carry away pleasant recollections of his stay in Rhodesia.

The Maize Competition.—The results of the maize competition are made known in another part of this Journal, from which it will be seen that the first three places are taken by (1) Mr. D. C. Forbes, Arcturus, with a plot yield of 63 bags and 26 lbs.; (2) Macdonald Bros., Inyazura, with 60 bags and 143½ lbs.; and (3) Mr. E. H. South, of Salisbury, with 60 bags and 124 lbs. There were 174 plots entered, and the Maize Association is to be congratulated upon the success of this venture, which is to be repeated next season. A committee comprised of Messrs. H. B. Christian, T. Mossop, L. Noaks, A. D. Husband and C. Mainwaring has been appointed to analyse the results and draw up a report, which we hope to publish in a later issue of this Journal.

We do not wish at this stage to make any comment upon the results, beyond congratulating the winners upon their success in the face of the keenest rivalry and to express the hope that farmers next season will afford even greater support to this very useful and practical competition.

Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance.—An announcement is made in this Journal

drawing the attention of merchants and vendors of fertilisers and farm foods to the regulations governing the sale of these articles in this Colony. Both farmers and merchants should remember that the above-mentioned Ordinance was formulated to ensure fair treatment to all concerned, and it is a matter of importance to both classes that the regulations laid down in this Ordinance be rigidly observed. The provision in the Ordinance to which the attention of merchants and vendors is particularly called is the necessity for registering with the Department of Agriculture every fertiliser and farm food intended for sale within this Colony. The importance of this registration to both the merchants and to the farming community will be readily understood from the following clauses which appear in the Ordinance:—

"1. The name under which the fertiliser or farm food is to be sold must be of such a nature as will ensure identification of the article and clearly establish its connection with the actual applicant for registration, to the exclusion of any other firm or person.

"2. Before registration is accepted the Secretary, Department of Agriculture, must be satisfied that the brand under which the material is to be sold is of a sufficiently distinctive nature to avoid its being mistaken for any other brand already registered.

"3. The applicant for registration is required to state the composition of the product and the source from which the principal ingredients are derived."

From the foregoing regulations it will be seen that before registration can be effected it is necessary for the applicant to satisfy the Secretary, Department of Agriculture, that these regulations have been complied with. Before approving the registration the Secretary will satisfy himself that the name under which the fertiliser or farm food is to be sold is not misleading to the purchaser, and also that the terminology used in expressing the percentage composition of the article complies with the terminology laid down in the regulations of the Ordinance.

Sale of Farm Foods and Fertilisers.—The existing regulations require the merchant or vendor to give or send

to the purchaser at the time of delivery an invoice stating the quantity sold, the name and brand under which the article is registered and also its registered chemical composition. The statement in the invoice is deemed to be a guarantee that the article is as described therein. Further, provision is made whereby any registered article may, at any reasonable time, be sampled by any duly authorised person and submitted to the analyst for analysis.

The difficulty that may be experienced by manufacturers and merchants in maintaining their products to the exact composition stated in their registration has been realised by the Government, and therefore a reasonable margin of error is allowed. In the past the Government of this Colony has been very lenient in the administration of the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance in order to allow the merchants and vendors an opportunity to acquaint themselves with the provisions of the law. This leniency, however, cannot continue indefinitely, and those concerned who have not already done so should make themselves acquainted with the regulations, and in registering their products should allow themselves a reasonable margin for possible variations in the chemical composition of their products between the time of manufacture and the time of delivery (this refers, of course, chiefly to the sale of superphosphate) or to difficulties that may arise in obtaining a uniformly mixed product.

Provision is made in the Ordinance whereby the names, brands and guaranteed composition of all fertilisers and farm foods registered under the regulations, together with the names of the manufacturers or importers or vendors, and such additional information, including reports of analyses at the instance of the Government, as circumstances may render desirable, shall be published in the *Rhodesia Agricultural Journal*. This information will appear in future in our May issue.

It should be particularly noted by all purchasers of fertilisers and farm foods that they should, in their own interests, demand from the merchant or vendor the name under which the article is registered, together with its chemical composition, and should avoid purchasing any article of which these particulars cannot be given.

Rhodesian Tobacco at Olympia.—We have received a report from Messrs. Jul. Siemssen & Co., leaf tobacco merchants, of London, who displayed samples of tobacco from Southern Rhodesia at the recent exhibition at Olympia, in the course of which we are informed that this stand was visited by most of the prominent manufacturers in the country. The manufacturers expressed themselves very satisfied with the types shown and the possibilities of using Rhodesian tobacco in larger quantities in future. They made the statement that the biggest demand was likely to be for cigarette tobaccos, although this demand would be governed by the price. The point was also made that although Rhodesian tobacco was undoubtedly better graded than most other Colonial tobaccos, there was considerable competition from other Colonies.

The report states further that although the public did not visit the exhibition to the extent hoped for, there were quite a number of enquiries as to the possibilities of procuring pure Rhodesian cigarettes. The present difficulty is continuity of supply; but as soon as supplies warrant it, a pure Rhodesian cigarette will very likely make its appearance on the market. The report concludes with the following remarks:—

"We feel sure the stand has been of very material assistance, as not only has it given the public an opportunity of seeing Rhodesian tobacco in the leaf, but it has also interested manufacturers in Rhodesian who have been unwilling to use the tobacco before; besides which, a certain amount of business was done at the exhibition and one or two little lots disposed of which were rather difficult to sell, owing to the irregularity of the grades in question."

Tobacco Research.—We gather from "Nature" that an interesting development in the financing of industrial research has recently taken place in Australia. For many years tobacco has been grown in various districts, but for the most part the colour and aroma have been unsatisfactory, comparing most unfavourably with Virginian leaf. A leading tobacco manufacturing company in the Commonwealth, the British Australasian Tobacco Co., Pty., Ltd., has incor-

porated as much of the local leaf in its products as its customers will accept, and has made considerable effort, without much success, to discover the reasons for its inferiority. It has now offered to provide £20,000 towards the cost of a thorough scientific investigation of the whole problem of tobacco growing, on condition that the Commonwealth and State Governments provide £10,000. If, when this sum is exhausted, the results obtained appear to justify it, the company will give an additional £30,000 if the Governments will give a like sum. Thus altogether £90,000 will be available for the investigation.

The Commonwealth Government has accepted this generous offer, and the executive control of the work is to be handed to a committee of three members: Mr. H. W. Gepp (chairman of the Development and Migration Commission), Dr. A. C. D. Rivett (chief executive officer of the Council for Scientific and Industrial Research) and a third member, to be nominated by them, who will probably be Dr. Darnell Smith, of the N.S.W. Department of Agriculture. Dr. Smith has recently completed some very successful work on the control of blue mould in tobacco plants. The services of experts in tobacco growing, both in the Commonwealth and abroad, will be sought, but it is expected that many years of work will be required before the problem of growing first-class Australian leaf is solved. This is one of the first instances of a business organisation placing large funds for the investigation of a national problem in which it is interested at the disposal of government institutions, and it is to be noted that the company has deliberately refrained from seeking any measure of control of the work or of the expenditure upon it.

Empire Fruit.—In a recent issue of this Journal we expressed the hope that the Empire Marketing Board, which has been doing such excellent work in popularising Empire deciduous fruits in Great Britain, would extend its activities to include citrus fruits. We are pleased to see that the Board is doing this, and we have before us an advertisement which has appeared in all the principal newspapers of the United Kingdom. The advertisement reads as follows:—

"Christmas and oranges used to come in together a few years ago. You could have your fill of oranges when crackers and pantomimes were in season; but in the hot and dusty summer the thought of the orange's thirst-quenching juice was a vain and tantalising thought. We must thank South Africa for putting things right.

"Now, when summer comes, in come the South African oranges—and splendid oranges they are. And in comes the South African grape fruit too—that best of ingredients for breakfast at the start of a hot day.

"Nowadays you can have all the fresh oranges and grape fruit you want when you want them most. South African oranges are in season now. Try them. The men that grow them are among the best customers of our factories. The more we buy from the Empire orchards, the busier will our factories be kept."

We feel sure that this eloquent appeal will not fall on deaf ears. Oranges in summer are certainly preferable to oranges in winter, and we have no doubt that the British public will readily appreciate this fact.

If this campaign produces results in any way comparable with those obtained with deciduous fruits, the Empire Marketing Board will be rendering a very great service to the Empire. We in Rhodesia are particularly interested in the disposal of citrus fruits in the Home country and will wish this campaign every success. We have had a particularly favourable season, and our exports this year will constitute a record for the Colony. It is expected that some 150,000 cases will be despatched—the great bulk to the United Kingdom—and the quality of the fruit is exceptionally good. With the powerful assistance which the Empire Marketing Board is giving to extend the demand for South African citrus fruits, the prospects of orange growing in this Colony appear to be very bright. It has been proved beyond doubt that we can grow citrus fruits of a type suitable in every way for the British market, and there are extensive areas available in which all the necessary conditions obtain for the production of high grade fruit. Our output at present is but a fraction of what the Colony is capable of, and we feel sure that as the opportunities become better known citriculture will be an important factor in the

filling up of our empty spaces and the profitable employment of some of the surplus population of the Mother Country.

The Empire as an Economic Unit.—Some significant figures were quoted recently by Sir Alfred Mond in an address to members of the House of Commons, in which he proposed the formation of an Imperial Trade Commission to enquire into the possibility of organising the Empire into a single economic unit, each component part trading with the others on a free trade basis and the whole protected against foreign competition by a system of tariffs. The following particulars were given in order that his audience might get a true view of the whole position:—

1. Area of United States	3,026,789	sq. miles
Population	105,910,620	
(or 35 to the square mile)		
2. Area of Europe, excluding Britain	3,650,000	sq. miles
Population	427,000,000	
(or 117 to the square mile)		
3. Area of Britain and Northern Ireland	88,000	sq. miles
Population	47,157,958	
(or 536 to the square mile)		
4. Area of British Empire	13,909,782	sq. miles
Population	450,094,000	
(or 33 to the square mile)		

In foodstuffs the British Empire has—

Wheat	27	per cent. of the world's production
Rice	66	,, ,, ,,
Cattle	53	,, ,, ,,
Sheep	51	,, ,, ,,
Goats	78	,, ,, ,,

In elaboration of his argument, Sir Alfred Mond stated that at the present time no organisation exists which even attempts to co-ordinate these manifold resources systematically, to bring them into closer contact among Empire producers and consumers, to utilise the best volumes of trade and to obtain for members of the Empire any advantages in the commercial treaties of the world.

Sir Alfred Mond showed that of the total British exports in 1924 the Dominions, Protectorates, etc., took 40 per cent., while the imports from British Possessions amounted to 26½ per cent. of the total imports. It will be seen, therefore, that the Dominions took nearly half of Britain's total exports, while Britain only imported less than one-third of her requirements from the Dominions.

The object which Sir Alfred Mond has in view is summed up in the words:—"The obvious ideal is Imperial free trade, free exchange, without let or hindrance, of all products of the Empire within the Empire, so that each part of the Empire would produce that which it could produce best and cheapest, and to exchange and get the highest benefit in that way through most economic production and the best results of exchange of goods."

An Appreciation.

A subscriber writes:—"Please find enclosed P.O. for 5s. for subscription to the Agricultural Journal, *the value of which is sincerely appreciated and awaited and read with pleasure and profit, and I extend my thanks for the able assistance you are rendering the farming community."*

The Care of Tobacco Seed Beds.

(*Concluded.*)

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad),
Government Mycologist.

DISEASES NOT DUE TO PARASITIC ORGANISMS.

Although the points to be dealt with in this article do not in reality come within the scope of mycology, yet it would appear to be desirable to give a brief summary of the types of affection which have been brought to the writer's notice during the past season and which have been thought by the farmers to be in the nature of parasitic diseases. The question will naturally be asked, "What is a diseased plant?" and from the agricultural point of view, the answer which most readily presents itself is, "Any plant which, to its own detriment, does not function normally." It is the non-parasitic type of disease which is most frequently encountered in seed beds, and the cause almost invariably lies in faulty farm routine. There is, of course, always the possibility of inferior seed being obtained, but as there are several excellent strains of tobacco existent in this Colony, and provided that the seed is examined carefully and disinfected by the corrosive sublimate process as advocated (3), no real difficulty should be experienced in obtaining good germination.

Undoubtedly the most common troubles to be experienced in tobacco seed beds are poor germination and stunted and uneven growth of seedlings. These affections may be brought about in a variety of ways, but, in the experience of the writer, by far the most frequent cause is insufficient and irregular watering during dry weather, coupled with uneven sowing. The principal symptoms may be divided into

three classes, viz., (i.) bare patches and uneven growth throughout the whole bed, (ii.) plants dying off at one end of the bed, and (iii.) plants only growing at the bases of the stakes supporting the cheese-cloth wire and in two parallel lines running midway between the centre and the borders.

Symptom (i.) may generally be attributed to insufficient watering or uneven sowing, and the remedial measures are obvious. (For general directions, reference should be made to (4).)

Symptom (ii.).—On examination it is almost invariably found that the diseased end of the bed is the more remote from the source of water supply, and the explanation for the condition is that labourers empty their cans before completely watering a bed, return to re-fill the cans, do not go back to the place where they originally stopped, but prefer to start on a new bed. More careful supervision of labour is undoubtedly called for in this case.

The *Third Symptom*, though not occurring as frequently as the former two, has been observed on several occasions in Rhodesia. It is the result of watering the beds without removing the cheese cloth. The water does not penetrate the material evenly, but runs down to the lowest point of the sag in the cloth, and from there drops to the soil. A certain amount of water also flows down the stakes supporting the wire, but the remainder of the bed remains dry. It is only in the limited areas which receive water that the seedlings are capable of growing, all plants in the dry patches dying off.

One type of disease, therefore, which is often erroneously attributed to inferior seed is solely the result of insufficient supervision of the operation of watering. As has been explained previously, "damping - off" is favoured by too humid conditions. It is also apparent that young plants are easily killed by arid conditions. It is essential, therefore, that strict European supervision of all seed beds be established if healthy seedlings are to be raised.

Probably of next greatest importance as a cause of disease in seedlings is the soil. Frequently the writer has been called upon to diagnose a seed bed disease and has found the origin of the trouble to lie in faulty preparation. Overburnt soils, hard, insufficiently worked soils, and heavy, water-

Fig. 12. The result of an excess of wood ash and insufficient watering. The root tips of very small p'ants were shrivelled where they had come in contact with pieces of charcoal.

logged soils are too often encountered. The plants produced by these beds are uneven in growth, usually of a pale colour; whilst bare patches are common where growth has completely failed. Another cause of irregular growth lies in the unevenness of the soil surface. If the bed is sloped or small cavities are allowed to remain, the seed is washed during sowing and by watering operations from the level surface into the holes, where it accumulates and subsequently produces closely bunched plants, leaving large bare patches over the remainder of the bed.

An apparent "damping-off" of seedlings can also be brought about by the presence of an excess of wood ash in the soil. Plants with leaves a little smaller than a sixpence turn yellow in colour and eventually collapse and dry out. An examination of the minute root tip of the diseased plant shows it to be stained brown and suggests the presence of a parasitic organism. Although in one case certain fungi have been isolated, yet in the majority of cases these shrivelled root tips have yielded no parasitic organism when plated out on nutrient media. On the other hand, an examination of the soil from which a clump of diseased seedlings had been removed almost invariably revealed the presence of large pieces of charcoal immediately below the roots. In numerous instances it has been observed that seed which apparently gave a very poor germination in the seed beds has passed a laboratory germination test well, whilst an examination of the seed bed soil has demonstrated an excess of wood ash. Now it is known that wood ash contains a relatively high percentage of potash, and the apparent "damping-off" of very young seedlings has been due to potash burn of the delicate tap root tip. Fig. 12 shows the appearance of seed beds which contain too great a proportion of ash.

Unhealthy growth can also result from lack of fertiliser in the soil. Plants becoming pale in colour and often turning yellow indicate a deficiency of nitrogen, and it is the usual practice to water with a solution of nitrate of soda as a corrective. If this solution should contain too great a concentration of the nitrate, or is applied when plants are very young and tender, a shrivelling and drying up of leaves is almost certain to take place as a result of the toxic effect of the chemical upon the delicate cells of the

young plant tissues. This disease, usually known as "fertiliser burn," is frequently mistaken for "damping-off."

It is of common occurrence to receive in this laboratory plants possessing a long, woody stalk, poor root system and of a pale yellowish-green colour, with a request for a diagnosis of the disease. This condition should be recognised immediately by the farmer, since it is merely the result of excessively heavy sowing. Plants which are crowded together will grow in height, in their struggle for existence, at the expense of leaf production, and this condition should be forestalled in the early stages of growth by judicious thinning out of the very young seedlings before they have developed an extensive root system.

Finally there are various markings of the leaves which have the appearance of parasitic diseases, but which are in the majority of cases due to mechanical agencies. A heavy rain storm on unprotected beds will cause much damage by tearing the leaves of the young plants, which, after being exposed to the heat of the sun for a day or so, turn brown in and about the injured tissue; often a certain amount of "firing" is also brought about. Sun scorch is a common condition in seed beds from which the cheese cloth has been removed too prematurely or too suddenly, and is sometimes thought to be of a parasitic nature.

Brown lesions on the leaves cannot be considered as true symptoms of any particular disease, but are due to the death of the cells in the affected area. This may be brought about by any of the agencies already described, but is probably more often the result of mechanical bruising. Careless handling by natives of cheese cloth, rough treatment of the plants during weeding operations and the action of the wind in blowing leaves against the wire or bricks of the seed bed must all be taken into consideration when making an investigation. Previous articles have described in detail those affections which are of an infectious nature, and every farmer should make himself familiar with the early symptoms of organic diseases. That a disease is infectious is usually indicated by its spread in the seed beds, and every precaution should be taken at the earliest opportunity to deal with the outbreak. Damage which is confined to isolated patches can, however, usually be looked upon as

non-infectious, and the origin should be sought in the routine of the farm.

REFERENCES.

(3) Hopkins, J. C. F.: "Care of Tobacco Seed Beds"; *Rhodesia Agricultural Journal*, August, 1927.

(4) Brown, D. D.: "Tobacco Seed Beds"; *Rhodesia Agricultural Journal*, September, 1926.

"Stogol" Cattle Dip.

It is hereby notified that "Stogol" Cattle Dip, in the dilution of one gallon of dip to four hundred gallons of water, conforms with the standard strength laid down by the "Cattle Cleansing Act, 1927."

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S.,
Director of Veterinary Research, Southern Rhodesia.

"*Tempore ruricolæ patiens fit taurus aratri.*"—Ovid.

Which, being interpreted, means "In time the ox becomes accustomed to the farmer's plough." This power of becoming accustomed to harmful things is one which is possessed by animals large and small; by the ox, the ass, the farmer himself, and even by the so-called microbes which inhabit the farmer and his stock.

From the moment of birth there is a constant war waging between the defences of the body and the harmful influences which assail it. Sometimes it happens that the defences prevail and the invaders are overcome; sometimes the offensive proves too strong and the animal dies. But frequently it happens that the one cannot destroy the other, and a state of armed neutrality is arrived at, and the one becoming accustomed to the other, they, like the fortunate people in the fairy tales, "live happy ever after."

Tolerance.—This state of equilibrium is known to those who study the science of immunology as "tolerance," and French scientists have given it the name of "premunition," which is derived from the Latin *præ*, before, and *munire*, to fortify, and clearly indicates what is meant.

Tolerance can become established against many things, for example against drugs. The tolerance developed by Thomas de Quincey to enormous doses of opium is well known; the habituation of the peasants in the Austrian Tyrol to doses of arsenic is another example. But it is not intended in this note to deal so much with tolerance to drugs as with that which occurs against disease-producing micro-organisms, and particularly those belonging to the protozoa, lowly

forms of animal life which are responsible for many if not most of the stock diseases in this country. In such cases tolerance is generally the result of recovery from previous infection: that is to say, the animal has first to suffer and recover from the disease before immunity is established. Such immunity can rarely be brought about artificially by the methods employed in conferring protection against bacterial diseases.

Bacterial Vaccines.—In the case of many diseases caused by bacteria which are lowly forms of vegetable life, immunity can be established by inoculating the susceptible animal with large quantities of the bacteria or of the toxins or poisons which they produce. Like the moulds which grow on our boots during the warm wet weather, bacteria will grow upon suitable media such as beef tea, white of egg, and indeed in and on all sorts of preparations in liquid form or stiffened by the addition of gelatin or agar-agar, a glue-like substance prepared from certain varieties of Japanese seaweed, and having the advantage over gelatin in that it does not liquefy at high temperatures. The bacteria, however, are very particular in their requirements. Some require one sort of nourishment, some another; some grow best at one temperature and some at another; some require oxygen for their growth and others will only grow when oxygen has been excluded.

The anti-quarter-evil vaccine may be taken as an example of a bacterial vaccine. This is prepared by growing the bacterium which causes quarter evil, the *bacillus chauvœi*, in a medium free from oxygen. One of the media in which it grows best is prepared from liver extract to which brain substance has been added. Not all vaccines require brain substance in their preparation. When growing in this broth, the bacillus produces a toxin and gives off a gas having a characteristic smell. Having grown vigorously for a time, growth and gas formation cease, and the bacteria form seeds or spores which are very resistant to adverse conditions such as heat, desiccation and light. It may be mentioned that it is due to these spores that the disease, once introduced on a farm, persists so long. By special filters made of porcelain and similar materials, the bacteria and the solid matters contained in the broth can be filtered off and the liquid passing through the filters contains the toxins

only, free from the microbes. It is therefore incapable of setting up infection, but when introduced into a susceptible animal, gives rise to a stimulus which excites the defences of the body to form an anti-toxin. This anti-toxin is specific for the quarter-evil toxin, that is to say, it will not protect against the toxins of any other bacteria. It is as specific for the particular toxin as, let us say, a Yale key is for a Yale lock. Now, the quarter-evil microbe when invading the animal is very dependent upon its toxin, which, as it were, prepares its way before it by paralysing or repelling the defences of the body. If, then, under natural conditions the quarter-evil bacillus gains entrance into an immunised animal, it can make no progress because its chief weapon of offence, the toxin, is check-mated or neutralised by the anti-toxins which remain in the animal's tissues for months and possibly years after inoculation.

There are several other methods of setting up immunity against quarter-evil, but the so-called "filtrate" method is discussed here because it is an example of immunity being created artificially against the toxin of a parasite as distinct from the parasite itself. The quantity of the toxin introduced is small, say, 5 c.c., as compared with the enormous quantities of anti-toxins to which it gives rise and which appear to continue to be formed for indefinite periods. It is probable, also, that if during the period of immunity the animal becomes re-infected, the immunity is "reinforced," that is to say, the immune bodies are formed in increased quantities and the duration of the immunity is prolonged.

There are various methods of setting up immunity against bacterial disease by means of vaccines. The most common is to grow the organism artificially and then reduce its virulence by heat or by chemical means so that it is no longer capable of setting up disease, but when introduced into a susceptible animal gives rise to re-action which stimulates the production of anti-bodies specific against the particular microbe of full strength as met with under natural conditions.

Protozoa.—Unfortunately, immunity cannot be set up in this way against the protozoa or animal parasites, which cannot be grown in bulk in the laboratory and the toxins of which cannot be collected in quantities. The best way of

growing these parasites is in the susceptible animal itself. Here they may give rise to disease more or less severe. If too severe, the animal dies; if not, it recovers. In some cases on recovery the parasite dies or disappears—this is said to occur in East Coast Fever—in others the parasite remains, but produces no appreciable ill effects. This happens in red-water and gall-sickness of cattle, trypanosomiasis of game and occasionally of domestic animals, malignant jaundice of dogs, malaria of man, spirochætosis of poultry, and several other diseases. Such recovered animals become "carriers," and the parasite, although harmless to them and undiscoverable by the microscope, remains in their blood. If taken up by ticks, tsetse flies or other blood-sucking parasites, it may be transmitted by them to the next susceptible animal upon which they feed. This is known as mechanical transmission. Or it may establish itself in the "intermediate host" and undergo development in it, to be transmitted to the animal host at some future date. This process is known as "cyclical transmission," and takes place in all those diseases referred to above.

That animals for long periods after recovery continue to harbour the parasite can be proved by drawing off a quantity of their blood into a syringe and injecting it into a susceptible animal, which will develop the disease, possibly in an acute form, although the "carrier" animal was apparently in the best of health. This indicates that the parasite has not lost its disease-producing properties, but that its virulence is retained in the recovered animal.

Red-Water "Carriers."—This has been frequently demonstrated in the case of red-water and gall-sickness of cattle. These diseases being transmitted by the "blue tick," all young animals born and reared upon tick-infested areas become infected early in life, although they may not at any time appear to be sick. Young animals of the indigenous breeds suffer less severely than pure-bred animals of imported breeds and their crosses. Now, if the blood of a native animal from tick-infested veld is taken and inoculated into an imported bull, it will infect that animal first with red-water or piroplasmosis, which will develop in about a week, and later with gall-sickness or anaplasmosis, which will develop during the second month after the introduction of

the blood. The diseases thus set up may be of deadly virulence, and the animal may die of either one or the other. The same thing may be brought about by tick infection, although the periods between infection and re-actions may be longer.

The point is that cattle in this country which have at any time been infested with blue ticks are nearly all "carriers" of red-water and gall-sickness and a source of danger to imported stock and their grades, or cattle reared upon areas from which ticks have been eliminated by prolonged systematic dipping. Such animals, therefore, have to be protected by vaccination, but this cannot be done in the same way as in bacterial diseases.

As previously stated, immunity in protozoal diseases can only be brought about as the result of recovery from an attack of the disease, and in the case of red-water and gall-sickness, a method of conferring protection has been based upon this principle. The blood of a susceptible animal, that is, one containing the two parasites *Piroplasma bigeminum* and *Anaplasma marginale* of low virulence, is introduced into susceptible animals and actually gives rise to the diseases more or less severely. In calves "at heel" the reactions are less severe than in weaned animals, and in native-bred animals than in those of imported breeds. This method of inoculation, therefore, is far from satisfactory, but in the light of existing knowledge is the best that can be devised. Further research is necessary to improve it or to find an alternative method entirely free from its disadvantages. It may be claimed for this vaccine, however, that in the past it has proved of considerable value in protecting bulls imported for the improvement of our local cattle, and that many of the best herds in the country at the present time have been built up from such animals. It has also proved useful in protecting young animals bred upon tick-free farms when exposed to natural infection on undipped areas. The following extract from a letter from a prominent breeder emphasises this contention. He writes:—"I understand that the vaccine against red-water and gall-sickness is not available at present. Its use has been of inestimable value to the cattle industry, and has been the means of saving a large proportion of the annual crop of calves.

These in turn have been sold and the proceeds circulated to the general benefit of the community. Buyers have become so accustomed to the benefits of inoculation that unless they can procure these protected animals in Rhodesia they will be compelled to purchase elsewhere. This is a double loss to the country, first in the large number of unprotected animals which die and which really cannot be spared for grading up the herds, and again in the capital loss entailed." Unfortunately, as mentioned in this letter, the issue of this vaccine had to be suspended and could not be renewed until cattle from overseas, upon which to carry out the necessary tests, could be obtained. Owing to "foot and mouth disease" in Great Britain this has been impossible during the past two years, but recently six bulls have arrived from Jersey, and the necessary experiments can now be carried out. It is hoped that in the near future a vaccine suitable for general use will again be available.

Misconceptions.—There are and always have been many misconceptions concerning the inoculation against red-water and gall-sickness. The first is that it seriously retards the growth and reduces the fertility of inoculated animals. One has only to point to such well-known prize-winners as Mr. Jack Mack's "Gem" and "Genesta" and their progeny, or to the herds which have been sired by inoculated bulls, to refute this contention. Another is that the vaccine has curative properties. This, of course, is incorrect, and no such claim has ever been made for it. From what has been written above, and dozens of times before, it should be clear that it is protective rather than curative, because it is only after recovery from the infection brought about by the inoculation that immunity or "tolerance" is established. Such "tolerance" to red-water is not established until at least fourteen days after inoculation, and against gall-sickness not until two months after vaccination. It is therefore useless to vaccinate an animal already infected by natural means, or animals running upon tick-infested veld. The vaccination process must precede natural infection.

Some breeders have expressed the opinion that they prefer natural tick infection to artificial vaccine infection. This is wrong in principle for the reason that they never know the virulence or severity of the infection which the ticks may

convey. As has been explained, the virulence of the red-water and gall-sickness elements in the vaccine has been deliberately and carefully attenuated by passage through the calves of native cattle. When it is thought that a virus of low virulence has been arrived at, it is tested upon highly susceptible animals before it is issued for general use. When passed through such animals, it immediately regains its virulence, and their blood would prove of deadly virulence if transferred by syringe to other susceptible animals. Imported animals and their grades are therefore unsuitable as "reservoir animals" from whence to derive virus for issue. Under natural conditions the ticks act as the transmitting agents, but they are less discriminating in their selection of a virus. The mother tick may have engorged upon an imported animal or a highly graded animal carrying in its blood very virulent parasites, although "tolerant" to them. These parasites would pass through the eggs of that tick into the many thousands of seed or larval ticks hatching from them, each of which would then be capable of infecting a susceptible animal when feeding upon it. By this method, therefore, neither the quantity nor the quality of the virus can be controlled; it is essentially "haphazard," and frequently attended by disaster.

Trypanosomiasis.—It is well known that the game live in the tsetse fly areas and carry the trypanosome in their blood, although apparently unharmed by it; in other words, they are "tolerant" to it. But their blood transmitted by the fly, or experimentally by the syringe, to susceptible animals, may set up a fatal infection. It has also been found that the virulence of the parasite may be increased or reduced by "passage" through different hosts. For example, when in 1909 it was sought to study the parasite infecting cattle in the Hartley district, rabbits were inoculated with blood from infected oxen, but the majority of them did not become infected. At last one rabbit which had been inoculated several times developed the disease, and from that animal it was easy to infect other rabbits. As the virus was passed from rabbit to rabbit it became more virulent, and killed in a progressively shortened period, so that whereas the first rabbits died several months after inoculation, those inoculated later in the series died within a few weeks and even days after infection.

It is probable that the trypanosome also produces a toxin by means of which it exerts its harmful effects. There is a trypanosome of sewer rats which at times is almost as numerous as the red cells in the blood of the infected rat, but which does not cause heavy mortality among its natural hosts. On the other hand, when a sheep is inoculated with the so-called *Trypanosoma rhodesiense*, parasites are never numerous in the blood, although the animal may be obviously and acutely sick. This suggests that it is not so much the parasite itself as its products which cause the disease.

It has been found recently that the antimony treatment of "fly-struck" cattle rarely sterilises the animal of parasites. They disappear for a time and then re-appear. In time even they become "tolerant" to the drug. But in spite of their continued presence, the animal recovers and in the long last becomes "tolerant" to them, possibly to their toxins. Such an animal becomes a "carrier," but it is to a considerable degree resistant to re-infection. These facts, discovered as the result of practical experience and scientific observations, suggest a method of setting up a "tolerance" in domestic stock which is being investigated at this laboratory, and which, if successful, may materially assist those endeavouring to open up the valuable areas now closed to settlement and development by the presence or menace of the tsetse fly.

East Coast Fever is another disease caused by a protozoal organism which develops partly in the tick and partly in the bovine animal. Having been introduced into the latter by the infected tick, it establishes itself in the spleen, glands and bone-marrow, and undergoes rapid development. About thirteen days after infection the infected animal shows an elevation of temperature, and the so-called Koch's bodies, which are a characteristic development form of the East Coast Fever parasite, may be found in their internal organs. Later, when the parasite is in danger of bringing about the death of its host, other forms of it make their way into the blood stream, from whence they may be taken up by the brown tick feeding upon the sick animal, in which the cycle again commences.

The mortality among animals infected with East Coast Fever is very high, and few recover, but in them the para-

site is said to die out. Gonder, a scientist working in Sir Arnold Theiler's laboratory, in the annual report for 1909-10 wrote, "It is a fact that no parasites are to be discovered in so-called salted cattle, *i.e.*, immune against East Coast Fever, and that the latter have, up till now, always been found not to be subject to relapse, which proves that the parasites must perish after a certain period, and that they cannot undergo parthenogenesis. It is also impossible to transmit East Coast Fever by means of blood, a circumstance which speaks against a further development of the parasite in the blood."

To make the above clear, it may be well to explain that the word parthenogenesis means the power to develop without "syngamy," that is, sexual union. "Examples of syngamy being in abeyance are not wanting even in higher organisms. An instance is the banana tree. In the wild banana seeds are produced from flowers of a normal type by fertilisation, just as in any other flowering plant. In the cultivated banana, however, the flowers are sterile and incapable of fertilisation, consequently the tree bears fruit which are entirely seedless. Hence the cultivated banana tree is propagated entirely by a non-sexual method, namely, by the production of suckers growing up from the roots, and in no other way. Whether this complete abolition of sexuality will in time lead to exhaustion of the cultivated race of banana remains to be seen, but at present there seem to be no signs of loss of vigour under cultivation" (Minchin). The sexual processes in the development of the East Coast Fever parasite take place in the tick, not in the ox. If, therefore, the parasite in the ox does not undergo parthenogenesis, there must arrive a stage when development ceases and the parasite dies out. This is the theory generally accepted by scientists and which has led them to believe that the salted ox cannot become a "carrier," and, on recovery, can no longer be a source of danger. In Gonder's own words, "Since we do not find parthenogenesis, the animal is completely protected against relapses, and recovery leaves a complete sterile immunity. No tick can infect itself on this animal, and no infected tick can infect such a beast."

There are some, however, who do not accept this theory, chiefly practical men, who point to the mysterious manner

in which cases of East Coast Fever crop up after an interval of many years on the sites of old outbreaks and among herds in which recovered animals are said to remain. Others also doubt the accuracy of the theory for scientific reasons. The argument that the "parasite must perish" is based upon the assumption that the recovered animal does not relapse, and that the disease cannot be transmitted by blood inoculation.* This is not accepted, and it is pointed out that there is a disease known as Egyptian fever of cattle caused by a parasite indistinguishable from the East Coast Fever parasite, which also cannot be transmitted by the injection of enormous quantities of blood into susceptible animals; and although for long periods recovered animals show no signs of the disease, they are subject to relapses, when once again parasites are found in the blood and plasmospheres resembling Koch's bodies in the internal organs. On the other hand, another disease of cattle in Algeria caused by a parasite resembling the East Coast Fever parasite in every respect can be transmitted by blood inoculation. It is urged, therefore, that in spite of the failure to find parasites in animals recovered from East Coast Fever, they may be present in some unrecognised form which may remain latent or dormant, and that the animal may remain "tolerant" to them until such time as the influence which restrains them is relaxed and their development can re-commence.

* Post-script.—Since the above was written the Annual Report of the Pasteur Institute, Algiers, by the Director, Dr. Edmond Sergent, has been received, and the following is a rough translation of a very important paragraph:—

"Among the bovine piroplasmoses of Algeria the theileriases offer great analogies with a malady of South Africa known under the name of Coast Fever. It was desirable then to compare the one with the other. The courtesy of Doctors Theiler and Du Toit of the Onderstepoort Laboratory (Transvaal) has enabled us to study Coast Fever at Algiers itself by submitting cattle to the bite of infected ticks. One has thus been able to establish with certainty that the North African theileriasis and the South African theileriasis are absolutely different diseases. However, one of the characters which at the onset appeared to particularly distinguish them has, during the course of the experiments, proved to be without value. It was hitherto admitted that Coast Fever was not transmissible from the sick animal to the healthy animal by the inoculation of infected blood; on the contrary, such transmission is almost constantly possible in the case of North African theileriasis. Many positive results have proved the blood of cattle at the height of an acute attack of South African theileriasis to be virulent and to give the disease to new (susceptible) animals contrary to the classic idea."

Edm. Sergent, A. Donatien, L. Parrot, F. Lestoquard et E. Plantureux, Sur la virulence du sang dans la theileriose sud-africaine a Theileria parva, C.R. Acad. des Sc., t. 183, 27 decembre, 1926, p. 1362.

The question is one of great practical interest and importance. There is a great deal of evidence on both sides, but in the present light of our knowledge the matter is still *sub judice*. A number of "salted" animals, proved to have been infected with East Coast Fever by microscopic examination, have been collected by the Veterinary Department. These will be kept under strict quarantine and constant observation, and be subjected to certain tests with a view of obtaining definite information which alone can solve the problem.

Agricultural Parcels Post Service

BETWEEN SOUTHERN RHODESIA AND THE BECHUANALAND PROTECTORATE.

It is hereby notified for public information that a service for the exchange of agricultural parcels has been introduced between Southern Rhodesia and the Bechuanaland Protectorate (excluding Maun, Kasane and Ghanzi) with effect from the 1st August.

The regulations applicable to the service will be those in force in Southern Rhodesia, and the rates of postage will be as follows:—

For a parcel not exceeding 2 lbs. ... ... 3d.

Over 2 lbs. and not exceeding 3 lbs. ... ... 6d.

and 3d. for each additional 1 lb. thereafter, up to a maximum of 11 lbs.

Small Earthen Storage Reservoirs.

(*An article bearing the above title appeared in the* Rhodesia Agricultural Journal *for April,* 1915, *the author being the late Mr. W. M. Watt, Irrigation Engineer. This article has now been revised and added to by Mr. C. L. Robertson, B.Sc., Irrigation Engineer, and generally brought up to date.*—Ed.)

In most irrigation schemes it is essential to provide for the storage of water. In some cases it may only be necessary to provide for the storage of the night flow of a stream, in others for the storage of several days' flow; or it may be necessary to store flood water for use in the dry season.

In the first two instances the storage would be supplementary to the main scheme, while in the last case the whole success of the scheme will depend on the storage provided. In selecting the site for an earthen storage reservoir, a number of factors have to be considered, of which the following are the most important:—

(1) Existence of suitable foundations for the embankment.

(2) Presence of suitable material in the neighbourhood for making the bank and core wall.

(3) Presence of natural features at the site, permitting of the construction of an efficient spillway channel at a reasonable cost.

(4) Capacity of the impounding basin in relation to an economical height of wall.

(5) The area of land suitable for irrigation within a reasonable distance of the dam site.

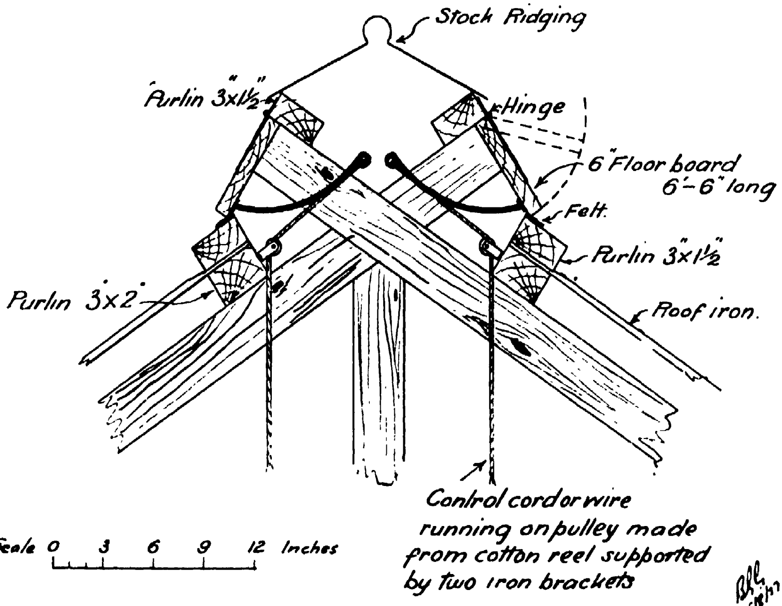
(6) If flood water is to be stored, the probable minimum run-off from the catchment area should be considered in relation to the capacity of the impounding basin.

(7) The economical aspect of the scheme, i.e., the total cost of the storage work in relation to the area of land irrigable.

Apart from purely irrigation purposes, however, small earthen storage dams are often constructed at a very moderate cost with the object of providing water for stock during the winter months, and are also used as a measure of flood control on small tributary streams. In the latter case these dams serve the very useful purpose of improving winter flow conditions in the stream below them, and they also hold up silt.

Foundations and Embankment.—The nature of the underlying formation should always be proved by sinking trial pits along the site of the proposed dam. For an earthen embankment the best foundation is a compact soil, underlain at a shallow depth by an impervious formation such as solid rock or clay. In the centre of the embankment it is usual to construct a core of concrete or puddled clay, which is carried down below ground level to the impervious underlying formation. Beds of gravel or sand underlying an earthen embankment have in every case to be efficiently cut off by means of a core wall, otherwise these beds will merely act as pipes for discharging water from the dam and there would be a serious risk of failure of the embankment. It is, of course, not always possible to obtain an absolutely impervious foundation, but in these cases special advice should be obtained as to the depth to which the puddle core should be carried and the drainage of the down-stream face of the dam.

The nature of the soil available for the embankment is another very important point. Most of the black vlei soils in Rhodesia are too clayey and contain too much humus to be suitable. A fat clay soil is liable to become slushy, to slip and to crack, and, generally speaking, is too treacherous a material from which to form the entire embankment. The best material is one which contains a mixture of clay and "grits," such, for instance, as is found in a granite sub-soil. Most of our red soils are also suitable, but in the case of high embankments it would be desirable to add more gritty material to them. Sufficient clay should be present to enable it to bind the mass and thus render it water-tight, and



The system of ventilation illustrated above is that described by Commander R. M. G. Knight in the July issue of this Journal as follows:—"I have ridge ventilation, which is surely the correct type, the object being to remove the hot moist air, which naturally rises to the highest point. These ventilators are four in number in each barn, two on each side, and extend practically the whole length of the ridge, viz., two of 6 feet 6 inches each in a ridge length of 16 feet. They are constructed as follows: The rafters cross instead of meeting, and project beyond the middle point. This can be obtained on existing barns by straps lengthening the rafters. The bottom ventilators have scuttles leading the incoming air on to the top of the hot flues, more or less on the principle of the hot air muffle of a motor car engine."

enough gritty matter to give resistance against slipping. Indian practice recommends one part of black cotton soil to one part of "grits," with the puddle core wall not carried far above ground level. In America the proportion of grit used is much greater, but in these cases it is necessary for the core wall to be carried above top water level in the dam.

Flood Spillway.—In selecting the site, consideration should be given to the facilities afforded for constructing a permanent overflow, and in the case of large works, which will take more than one season to complete, for constructing temporary spillways to safeguard the bank during construction. In some cases a "nek" may be found some distance away from the proposed embankment. If such a "nek" exists at a suitable level, this makes the ideal overflow, but in the majority of cases in small dams an excavated spillway has to be cut on one or both flanks of the wall.

If the side slopes of the valley at the ends of the embankment are not too steep the excavation of a suitable spillway channel is not an expensive matter, particularly as the soil may often be used in the embankment. The provision of a spillway channel of sufficient capacity to pass the maximum floods without over-topping of the earthen embankment is of the utmost importance, as 99 per cent. of the failures of earthen dams have been caused by the spillway channels provided being of insufficient capacity. Any undue stinting of expenditure in this direction is therefore false economy. The spillway should be designed to carry off the largest probable flood with a low depth of water over the crest; whenever possible, this should not exceed 2 to 3 ft. If, owing to natural features, one is limited to a comparatively narrow and deep spillway, then expensive protection works have to be provided in the spillway channel, if excavated in earth, in order to prevent erosion of the channel due to the excessive velocity of the water.

In order to prevent the storage capacity of the dam being reduced by erosion of the spillway, it is necessary in most cases to construct a masonry or concrete wall about 18 ins. wide across the entrance to the spillway channel. The crest of this wall is usually about flush with the floor of the spillway channel. The grade of the spillway channel below this wall should not exceed 1 in 100, unless it passes

through hard formation. The following table will serve as a guide to the extent of wasteway accommodation necessary for different sized catchment areas in this country. It has been based upon the formula $Q = C M^{\frac{3}{4}}$, where Q is the maximum flood discharge in cubic feet per second, C is a constant dependent on the nature of the catchment area, and M is the extent of the catchment area in square miles. The value of the constant C has been based upon the maximum flood conditions observed from various types of catchment in this country during recent years, and varies from 400 for moderately sloping grassed catchments to 600 for steeply sloping grassed catchments and 800 for bare hilly catchments.

TABLE I.

Safe Spillway Widths for Various Catchments.

Catchment area in square miles.	Maximum flood discharge in cubic feet per second.			Length of spillway in feet.				
				3 feet depth of water.			4 feet depth of water. C_1	5 feet depth of water. C_1
	Moderately sloping grassed catchments. $C_1 = 400$.	Steeply sloping grassed catchments. $C_2 = 600$.	Bare hill catchments. $C_3 = 800$.	C_1	C_2	C_3		
1	400	600	800	35	51	64	...	...
2	673	1,009	1,346	56	80	105	...	...
5	1,337	2,006	2,674	100	146	195	...	...
10	2,250	3,375	4,500	164	246	328	102	...
15	3,050	4,575	6,100	222	333	444	138	94
20	3,785	5,677	7,570	276	414	552	170	116
25	4,470	6,705	8,940	326	489	652	201	137
30	5,125	7,687	10,250	374	561	748	230	157
40	6,360	9,540	12,720	464	696	928	286	195
50	7,520	11,280	15,040	518	822	1,096	338	231

In the above table the length of spillway with 3 ft. depth of water has been calculated for all types of catch-

ments, and for 4 and 5 ft. depth of water for the first type of catchment only for spillways in excess of 100 ft. in width. The necessary lengths of spillways for the other two types of catchment in these cases may be obtained from the lengths given by multiplying them by 1.5 and 2 for the second and third types of catchments respectively. Thus for a steeply sloping grassed catchment, 20 square miles in extent, the safe length of spillway would be 116 × 1.5, i.e., 174 ft.; and for a bare hilly catchment, 30 miles in extent, the safe length of spillway would be 157 × 2, i.e., 314 ft.

Further, it should be noted that while the foregoing table gives the discharges for different depths over the spillway, these depths do not imply that this is the actual difference of level between the crest of the dam and the spillway wall. An extra difference of at least 2 ft. should be added to the figures in the table to ensure against the risk of the embankment being overtopped by wave action during severe floods. This is termed the "free board" of the dam. A further safeguard may be obtained by keeping the centre of the embankment higher than the flanks, so that in the event of the spillway proving insufficient in abnormal floods, the ends of the wall would be breached instead of the centre and most expensive portion.

A protective training embankment between the spillway channel and the river bed may also be necessary to prevent the overflow water from damaging the toe of the main embankment.

Run-off from Catchment Area.—Before deciding on the height of the dam to be constructed, it is necessary to consider what proportion of the rain falling upon the catchment area is likely to run off and be available for filling the reservoir. The annual meteorological reports published by this Department contain information regarding the normal annual rainfall and the maximum and minimum annual rainfall experienced in numerous localities in this Colony.

In considering a storage project for irrigation the question of the probable storm flow available is of great practical importance. It is a subject on which it is easy to over-estimate, and the popular view is usually an over-estimate. An over-estimate means in practice that:—

(1) A dam with too large a storage capacity will be erected, and it will be found that the dam will only fill in very good years and not in normal years. A lower dam which would fill in normal years would probably have been the economical solution for the site.

(2) The area capable of being irrigated from the dam would also be over-estimated, and it would be found that there is not sufficient water available for the area contemplated.

If the smaller area had been originally considered as being the area capable of being normally irrigated, the scheme might not have been embarked upon at all, as being too costly for the area served.

The amount running off will, of course, differ in different types of catchment areas. The factors influencing the run-off from a catchment area in the order of their priority are:—

(1) Distribution and amount of the rainfall on the catchment area. It is usual only to consider rainfall between the 1st November and 30th April, as rainfall at other periods of the year usually only produces an inappreciable run-off.

(2) Average slope of the catchment area.

(3) Nature of the catchment area; whether, for instance, it is rugged, covered with deep soil, etc.

(4) Nature of covering on catchment area, i.e., whether bush-covered, grassed, etc.

(5) Nature of the geological strata underlying the area, and whether it is permeable or impermeable to water.

(6) Size of catchment area; higher percentages of run-off are usually obtained from smaller catchment areas, owing to individual storms being more evenly distributed over them.

The following table shows the minimum run-off figures recorded on two typical catchment areas in this Colony. Catchment "A" is a typical high veld Rhodesian catchment, i.e., a gently sloping grass and bush covered granite veld catchment. Catchment "B" is a typical middle veld Rhodesian catchment, i.e., a steeply sloping, heavily grassed, mixed granite and schist veld, with numerous kopjes.

TABLE II.

Safe Run-off Figures for two Typical Rhodesian Catchments.

Rainfall. Inches.	Run-off in inches. Catchment "A."	Run-off in inches. Catchment "B."	Rainfall. Inches.	Run-off in inches. Catchment "A."	Run-off in inches. Catchment "B."
10	0.093	0.222	24	0.808	0.928
12	0.136	0.266	26	1.147	1.117
14	0.165	0.318	28	1.773	1.389
16	0.196	0.367	30	2.383	1.673
18	0.240	0.441	32	3.054	2.179
20	0.294	0.587	34	3.719	2.677
22	0.543	0.721	36	5.060	3.121

The practical application of this table is that if the records show that the rainfall conditions in the catchment are a minimum rainfall of 21.50 ins. and a normal rainfall of 32 ins. between the 1st November and the 30th April, then the estimated run-off from a catchment of "A" type will be obtained as under:—

Run-off for 21.5 ins. = run-off for 20 ins. + $\frac{1.5}{2.0}$ (run-off for 22 ins. – run-off for 20 ins.).

i.e., run-off for 21.5 ins. = $0.294 + \frac{1.5}{2.0}(0.249)$
$= 0.294 + 0.212$
$= 0.506$ ins.

and run-off for 32 ins. = 3.054 ins. direct from table.

As one square mile is equal to 640 acres, the storm run-off in acre feet per square mile of this catchment in a minimum year will probably be—

$$\frac{0.506}{12} \times 640, \text{ i.e., } 27 \text{ acre feet.}$$

Similarly, in a normal year the storm run-off may be calculated to be 163 acre feet per square mile. During the irrigation season 4 acre feet are required for each acre irrigated, allowing for evaporation and absorption losses, in an ordinary small earthen storage dam. An acre foot is a convenient unit for storage, and means the volume of water necessary to cover an acre to the depth of one foot. The following areas are therefore capable of being irrigated for each square mile of type "A" catchment above the dam:—

$$\text{Minimum irrigable area} = \frac{27}{4} = 6\tfrac{3}{4} \text{ acres.}$$

$$\text{Normal irrigable area} = \frac{163}{4} = 40\tfrac{3}{4} \text{ acres.}$$

For a type "B" catchment under these rainfall conditions it can be similarly calculated that the minimum irrigable area is 9 acres and the normal irrigable area is 29 acres per square mile of catchment. These figures multiplied by the total catchment area will therefore give the area potentially irrigable from the catchment under the worst and normal rainfall conditions.

If annual crops, such as wheat, etc., are to be irrigated it is fairly safe to figure on the normal flood run-off as giving the measure of the irrigable potentialities of the site; but if it is intended to irrigate permanent crops, such as citrus, then the minimum figures given above should only be considered as the area irrigable.

It should be noted that the above figures for areas irrigable are based on storm flow stored only. If the stream on which the dam is to be constructed has a reliable winter flow, then the figures may be increased in accordance with the flow available, and a flow of one cubic foot per second may be regarded as capable of irrigating 100 acres. (See *Rhodesia Agricultural Journal*, December, 1926, page 1117, for methods of gauging flow of streams.)

Capacity of Impounding Basin.—It is now necessary to determine whether the impounding basin with a reasonable height of wall is capable of storing the normal or minimum flood run-off from the catchment. Unless the catchment area is very small, it will be found that there are very few ordinary dam sites on farms in Rhodesia which are capable of storing the normal flood run-off, and the capacity of the site to store the minimum flood run-off, or somewhat in excess of this, becomes of the utmost importance.

A good storage site from the point of view of impounding capacity is one in which the longitudinal fall of the valley at the back of the proposed dam embankment is not steep; and further, the site is improved if the valley opens out into a wide basin, with flat side slopes above the dam site. In other words, the ideal dam site is a basin formation

with a narrow outlet in which the embankment itself can be located.

The only way to decide the capacity of the impounding area is to calculate the quantity of water that can be stored for different heights of embankment at the site. A contour survey would be required for the measurement of the impounding capacity of a large dam, but for a small dam the following method can be adopted for an approximate estimate of its capacity:—

The proposed full supply contour of the dam can be roughly flagged out by setting a mason's spirit level on a straight edge and holding this at the proposed spillway level for the dam. An assistant can be directed to put in flags at points where the line of sight along the straight edge, when brought to the level, cuts the ground. (If a surveying level is available, the methods described in the *Rhodesia Agricultural Journal*, September, 1925, should be adopted.)

The contour line as flagged out will probably be of a more or less elliptical shape, and as it is necessary to determine the extent of the area embraced, it should be cut up into one or more regular areas such as squares, rectangles or triangles. In transforming the curved lines into straight ones, the straight lines should be ranged out so that the overlap obtained should be approximately equal to the areas of the curved portions not embraced by these regular areas.

The area included below the full supply level of the dam can be obtained by adding the areas of these individual regular figures. To ascertain the area of a square, multiply the length of any two sides together; of a rectangle, multiply the length of one long side by the length of one short one; and of a triangle, multiply the length of one side by half the perpendicular distance of that side from the opposite apex. If the sides have been measured in feet, divide the product by 43,560, and if measured in yards, by 4,840, to get acres.

Having obtained the area in acres, the average depth of the water should be found. This can be ascertained by means of a pole, marked off in feet and inches, from which a large disc should be suspended on an endless cord passing freely through pulleys fastened at the top and near the bottom of the rod. By sighting across from one of the flags

on the top water contour to an opposite flag, the rod being at a point between, the disc can be raised or lowered until the centre of it is cut by the line of sight, and the depth then ascertained by the person holding the rod. These depths should be ascertained at numerous points at regular distances apart in lines ranged out across the valley. All the recorded depths should be added together and divided by the number of observations taken in order to obtain the mean depth. In doing so it should be borne in mind that observations must be included at the edge of the proposed top water level, where the depth will, of course, be zero, for unless these zero depths be taken into account the correct mean will not be obtained.

Having found the mean depth of the water in feet, multiply this by the area of the top water surface in acres, and the product will give the capacity of the proposed reservoir in acre feet. The capacity of the dam for the proposed height of embankment can thus be found, and it can be decided whether sufficient water will be stored to irrigate the area available, and if not, whether the height of the embankment can be economically increased, bearing in mind, of course, the limitations of the minimum flood run-off available from the catchment.

(To be concluded.)

Root Gallworm or Root Knot Eelworm.

(*HETERODERA RADICICOLA*, GREEF.)

By RUPERT W. JACK, Chief Entomologist.

The parasitic organism bearing the above names is attracting considerable attention with the development of the tobacco industry in this Colony, and it is thought desirable that an endeavour should be made to place the most recent information in the hands of the growers.

Unfortunately, careful studies of this pest have not yet been made in the Colony, and information concerning the life history will necessarily be culled mainly from the work of investigators in other countries. The same statement applies in a lesser degree to remedies, but observations of local origin constitute the basis of what appear to be the most hopeful methods of control in the field.

In the past root gallworm has not taken a very prominent place as a pest of tobacco in Southern Rhodesia, having chiefly come to notice in reference to potatoes and other garden vegetables, as well as ornamental plants. Latterly, however, it has given considerable trouble in seed beds and in the field.

Description and Life History.—The root gallworm is a minute worm-like animal belonging to the class *Nematoda*, which is an assembly of a vast number of more or less similar creatures, many of which are parasitic in animals or plants. A far greater number is, however, to be found in the soil, in decaying organic matter and in both fresh and salt water.

The present example is so small that the young and the males are quite indistinguishable to the naked eye in their

natural surroundings. The swollen females may, however, be distinguished as pearly white specks in the tissues of their host plants. Infestation of soil with this pest is shown by characteristic lesions in susceptible plants, taking the form of swellings or galls. These occur on the roots and underground stem, and in the case of leguminous plants need to be distinguished from the nitrogen fixing nodules. The latter have the appearance of lateral gall-like appendages on the smaller roots, but the galls caused by *Heterodera* form part of the root or stem itself, and in bad cases the whole root may be very much swollen. In potato tubers characteristic swellings are caused on the surface.

The female gallworm is to be found in these swollen tissues and there lays her eggs. The young, when hatched, tend to escape into the soil, with the breaking down of the diseased tissues, but quickly seek out fresh roots, into the tissues of which they penetrate to develop into males and females later. The period of the life cycle varies with prevailing conditions, but under normal growing conditions is stated to occupy about two months from the hatching of the egg to the time the female commences to lay. The young are stated to be able to encyst themselves, that is to say, to assume a condition of suspended animation within a protective capsule, and so to pass over unfavourable periods. This is one of the reasons why it is so difficult, if not impossible, to get rid of this pest in suitable soil.

Host Plants.—These are exceedingly numerous and include most cultivated crops and weeds, although some species are much more susceptible than others. It is an easier undertaking to mention the crops which are immune or nearly immune to attack. The latter include many plants of the grass family, such as wheat, rye and some varieties of oats and maize. Although not absolutely immune, these plants are so resistant that for practical purposes they may be considered as not liable to attack. Velvet beans are stated to be almost if not entirely immune, and this fact has been turned to good account in dealing with the pest in America. All crops such as potato, tobacco, French beans, cowpeas, gourds, etc., are susceptible, whilst many fruit trees also suffer. It is often impossible to raise susceptible crops profitably on badly infested land.

The symptoms of serious attack on most crops consist in general unthriftiness due to interference with the functions of the root. The plants often turn yellow and die if the infestation is heavy. It would appear, however, in some cases that a very fertile soil will counteract the effect of even heavy attack to a very considerable extent. On one occasion the writer was shown several plants from a crop of French beans which the grower stated had produced an exceptionally heavy crop. The roots of the plants exhibited were very greatly disfigured by gallworm attack, and the grower was under the impression that the galls were nitrogen fixing nodules! The root of one of these plants is shown on the plate. Usually, however, heavy attack means a very small crop or no crop at all.

In the case of potatoes the tubers are freely attacked, their appearance is badly affected and they may be unsaleable. In point of fact infested tubers should be unsaleable for seed purposes, and the presence of large numbers of minute worms can hardly be considered as adding to their value for human consumption. Badly infested potatoes are deficient in keeping qualities and tend to break down with one of the prevalent forms of rot.

Methods of Spread.—The original home of the gallworm is not known, but is thought to be in the tropics of the Old World. • Its distribution is now very wide. Distribution and spread of this pest to considerable distances may be brought about by the movement of nursery stock, but seed potatoes undoubtedly constitute the most important agency. With a view to checking introduction of gallworm to set up new centres of infection in the Colony, regulations are enforced in reference to potatoes, under which any consignment found infested with this pest at the port of entry is refused admittance to the Colony or destroyed. The same vigilance cannot, however, be exercised concerning the movement of potatoes within the Colony, and it is necessary for the farmer to be able to recognise infested potatoes and to guard against introducing such into the soil on his farm. Rhodesian and South African seed generally is quite frequently infested. There is less danger in seed potatoes from Europe, and so far there is no record of potatoes imported from the British Isles to Southern Rhodesia containing this pest. Purchasers of imported seed potatoes should, however, realise that

although regulations are enforced and inspection carried out with a view to preventing introduction of pests and diseases, the fact of a consignment having been passed by an inspector implies no guarantee that it is free from pest and disease. In some cases of light infestation or infection, involving no conspicuous lesions, detection is hardly possible from the comparatively superficial examination it is possible to give the potatoes at the port of entry.

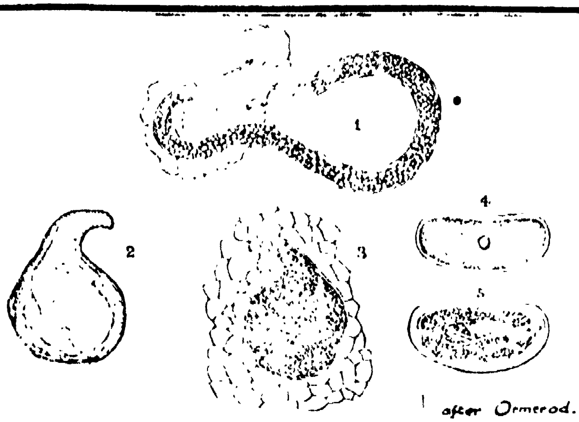
Carriage of root gallworm about a farm is almost inevitable unless very careful precautions are taken in reference to land known to be affected. In the case of tobacco seedlings or other seedlings the pest will undoubtedly be introduced with infested plants from the seed beds to the lands. Apart from this, soil adhering to implements and even the boots of the farmer himself or the feet of his labourers will tend to carry the gallworm, whilst a very important agency consists of flood water running from one land to another.

Infestation of Lands.—Necessary qualities in the soil include aeration, warmth and moisture.

Complaints received in reference to this pest are mainly associated with irrigated lands, including also tobacco seed beds and private gardens where water is applied in the dry season. It is considered doubtful if ordinary well-drained land in the greater part of the Colony becomes permanently infested. The drying out of the soil during the dry season appears to act as an effective check. This statement may not apply to certain localities near the eastern border or elsewhere where winter rains and mists are experienced. The lower levels of certain lands may possibly afford conditions enabling the nematode to survive the dry season, and from such the pest may be spread about the land and increase during the wet season, especially if the latter afford periods of prolonged moist conditions.

In the case of tobacco, plants from infested seed beds carry the pest with them, and conditions favourable to increase undoubtedly exist during the growing period of the plants. Consequently such crops would appear to be in much the same position as if the land were previously infested.

Whilst it is still necessary to maintain an open mind concerning the completeness or otherwise of the effect of the



ROOT NEMATODE. (Very much enlarged).
Fig. (1) Young.. (2) Female. (3) Female *in situ*.
(4) & (5) Eggs in various stages of development.

Plate 1.

Plate 3. Potato tuber, showing surface swellings induced by gallworm.

Plate 2. Root heavily infested with gallworm.

normal drying of the soil, observations up to the present certainly indicate that the prolonged dry season practically sterilises the majority of soils in reference to root gallworm, and that clean crops may frequently be raised on land which carried an infested crop the previous year. A possible exception may exist in the case of potatoes, where the small tubers, invariably missed in lifting the crop, would seem likely to carry the pest over the dry season. This is, however, not definitely proved, and further observations are needed.

Records of prevalence include sandy, red and darker soils. Sandy soils are generally reported to be the most favoured by the pest elsewhere. Irrigated soils in Southern Rhodesia are commonly red, and infested gardens at and around Salisbury consist frequently of red soil. Severe infestation of watered sandy soils is, however, very common in the Colony.

It has been shown in Florida that the nematode is often very numerous in soils below the depth reached by an ordinary plough.

Control.—From the foregoing remarks it would appear probable that climatic conditions in most parts of this Colony usually afford an effective weapon in fighting this difficult pest.

If clean seedlings are ensured the crop on average tobacco land would appear unlikely to suffer. The lowest levels, which in some cases may perpetuate the pest, can usually be thrown out of cultivation and allowed to revert to grass. Danger of transport of the worms from such spots will be minimised in this way.

Infested lands under irrigation will probably be greatly benefited by a thorough drying out for one season, assisted by being completely cleaned, ploughed and left in the rough.

This procedure is likely to give better results than attempting to grow a cash producing immune crop under irrigation, but if it is felt necessary to do this, a crop might be selected which takes complete possession of the soil and suppresses weeds, such as wheat. Good results are reported with velvet beans in the United States of America. A bunch variety is employed, constant cultivation is practised and all

weeds are kept out of the field. This method might be employed with advantage on irrigable land during the wet season following abstention from irrigation, especially if it is desired to renovate the soil concerned. Complete suppression of weeds in a summer rainfall climate is such a difficult undertaking that it is felt that reliance on this method without the aid of previous drying out may not achieve its object, but no data are available on this point in reference to Southern Rhodesia.

To the tobacco grower it is probable that the problem resolves itself almost entirely into a question of nematode-free seed beds. It appears doubtful if the ordinary treatment of the seed beds by burning is sufficient effectively to rid them of the pest owing to lack of penetration of the heat to a sufficient depth, but it has a beneficial effect when thoroughly carried out. Although the "open fire" method of sterilising seed beds is practised in the United States of America, it is not apparently relied upon by entomologists as a means of getting rid of root gallworm, and observations as to the depth at which the pest may occur are opposed to its complete efficacy. On the other hand, neglect to burn the beds has been followed by very severe infestation in this Colony.

A method of soil fumigation by means of hydrocyanic acid gas is now being tested extensively in America, and results so far reported are favourable. The chemicals employed are sodium cyanide, and more recently calcium cyanide.

The method would appear to be economically applicable to seed beds, although too expensive for extended use. In the case of sodium cyanide the chemical is applied in solution in water at the rate of 600 to 800 lbs. per acre, and this is followed by an application of 900 to 1,200 lbs. of ammonium sulphate per acre. One effect of the ammonium sulphate should be mildly to accelerate evolution of the gas from the cyanide, but is supposed also to have some repressive effect on the pest in itself. Calcium cyanide dust appears likely to prove cheaper, at least in America. The gas is evolved very rapidly from this dust, and the addition of any chemical to accelerate the process may be unnecessary. It contains approximately the same amount of cyanogen as the sodium compound—actually slightly more. Good results are re-

ported in Florida from sprinkling the dust in the furrows when ploughing fields.

Some experiments are at present proceeding in Southern Rhodesia in treating tobacco seed beds with calcium cyanide dust. Results obtained so far have been inconclusive.

Improved results from this method of fumigation are likely to be obtained from covering the beds after treatment with some impervious material to keep the gas from evaporating too rapidly. Tarred paper, held down with soil at the edges, has been recommended.

Tobacco growers can hardly pay too much attention to the immediate surroundings of their seed beds in reference not only to the nematode, but also to other pests. Weedy surroundings tend to encourage pests, and it is clearly illogical to expect the sterilisation of the beds, whatever means are employed for this purpose, to have the maximum effect, if weeds serving as host plants for the nematode are allowed to grow immediately adjacent. The beds themselves and their immediate surroundings should be kept clear of weeds throughout the year.

Wherever possible new ground should be selected for the beds. Old kitchen gardens and irrigated land generally are very liable to be infested.

The question of discovery or production of resistant varieties of various crops has received consideration in reference to this pest in different parts of the world, but information is lacking concerning the degree of success which has attended efforts in this direction.

SUMMARY.

(1) Root gallworm or root knot eelworm is a minute worm-like animal belonging to the class *Nematoda*.

(2) It feeds on the underground parts of a large variety of cultivated plants and weeds, producing gall-like swellings of the tissues, which interfere with the nourishment of the plants.

(3) It is frequently impossible to grow susceptible crops profitably on badly infested land.

(4) Immune or nearly immune crops include maize, small cereals and other grasses, also velvet beans; most other

cultivated crops are more or less susceptible, including potato, tobacco, French beans, cowpeas, gourds, etc.

(5) Gallworm persists indefinitely in suitable soils.

(6) Necessary qualities in the soil include aeration, warmth and moisture. Sandy soils have a bad reputation, but this pest is not confined to such soils in this Colony.

(7) In our climate it is probable that the hot months of the latter part of the dry season largely rid well drained soils of this pest.

(8) The gallworm under natural conditions can probably pass this unfavourable period successfully in certain low-lying and permanently moist places, perhaps also in better drained land in regions where winter rain is not infrequent.

(9) Irrigation or watering of the soil in the late dry season enables the pest to perpetuate itself, and such soil is most frequently badly infested. Tobacco seed beds come under this category.

(10) Infested tobacco seedlings when transplanted carry the pest with them, and conditions suitable to increase exist in the lands during the one wet season.

(11) Infested lands under irrigation can probably be greatly benefited by abstention from irrigation and consequent thorough drying out during the hot months preceding the rains.

(12) As an additional treatment, irrigable lands might be utilised for growing a practically immune crop during the wet season following the drying out process. Weeds must be kept suppressed.

(13) New soil should be used for seed beds wherever possible, and old garden sites and soil which has been used for irrigated crops should be avoided.

(14) Whilst "open firing" of tobacco seed beds is apparently not sufficient entirely to eradicate gallworm, the process appears to be beneficial and should always be practised.

(15) Experiments are proceeding with the treatment of seed beds for the purpose of eradicating this pest.

Cotton Seed for Planting.

By G. C. CAMERON, Cotton Specialist.

The following notes are written for the benefit of those farmers who are intending to plant cotton in the approaching season.

The results obtained from the planting of cotton during the last three years have been very discouraging. So much so that many farmers have decided to give up cotton altogether, and one can hardly blame them for doing so. The results obtained in the 1923-24 season were so promising that many looked upon the cotton growing industry as established. The succeeding seasons, however, have gone to show that such was not the case, and that much uphill work remains to be done before it can be claimed that cotton growing is on a sound basis in this country.

The 1924-25 and again the 1925-26 seasons were abnormally wet, so that it was considered, and probably with some justification, that the seasons were the root of the trouble. Had this been so we should have had a bumper crop of cotton in the season that has just come to a close; but, unfortunately, one has to admit that the last crop is, proportionately, worse than either of the two preceding ones. It is obvious, therefore, that the seasons have not been quite so much to blame as was originally thought.

As a result of the work at the Cotton Breeding Station, Gatooma, which follows closely the work of the Cotton Breeding Station, Barberton, it appears that the chief trouble which prevents successful cotton growing in Southern Rhodesia is the jassid, a small insect which sucks the juices of the cotton plant, and in doing so appears to have a poisoning effect on it. That this is the case has been amply demonstrated in a number of ways which need not be detailed here. As a further proof, however, if such were necessary,

it may be mentioned that jassid-resistant strains and selections have grown and produced well at Gatooma this year when the rest of the cotton succumbed, and produced only negligible quantities of lint of very inferior quality and staple.

Now that the chief cause of the trouble has been identified it is only a matter of time until jassid-resistant strains of cotton can be propagated, and multiplied up in sufficient quantity to permit a general distribution of seed which can be relied upon to give a good crop. As to how long this will take it would be unwise to make a definite pronouncement at the present time, but it is felt that sufficient seed for a limited acreage should be available in two years' time.

Meanwhile there are a number of farmers who wish to continue growing cotton as a rotation crop for their maize, as they feel that the enhanced yields obtained by doing so are worth the expense and trouble. There are others who are of the opinion that jassid may not be as bad next year as it has been over the past three seasons and are willing to take the risk. To supply prospective growers with seed is a very difficult problem, as the writer is of opinion that very little of the seed available in the country is fit for planting. A limited quantity does exist, and this has been supplemented by a further limited quantity which has been purchased from Durban. None of it, however, can be said to be resistant to jassid, and for this reason the writer is reluctant to recommend it except to those who wish to plant cotton as a rotation crop, and even then sufficient seed can only be promised for small acreages. Under the circumstances it is not anticipated that the demand for seed will be large, but for those who desire to obtain it from the Department of Agriculture an endeavour will be made to meet requirements.

Farmers wishing to obtain such seed should apply to the Secretary, Department of Agriculture, before the 30th September, stating quantity required. The estimated cost of this seed works out at not more than 1½d. per lb.

Suction Gas Tractors.

Owing to the tremendous growth of agricultural operations in this Colony during the course of the last three years, we are to-day faced with the necessity for a more economical use of labour, entailing the adoption of labour-saving devices wherever these can be employed economically. The utilisation of tractors in place of oxen is on trial at the present time on a number of farms, and many farmers have made enquiries as to the cost of running these machines. The controlling factors would appear to be the cost of fuel, oil and repairs, and of these the most important is fuel.

The internal combustion engine is capable of being operated by either gaseous or liquid fuel, the most common forms which the latter takes being paraffin and crude oil. Crude oil may be used and is extremely cheap in localities where natural deposits occur, but in this Colony we unfortunately are not so situated that crude oil would be economical. We are faced with the problem of having to purchase our liquid fuels from oversea markets if liquid fuel is necessary.

This is also the position in many other parts of the world where economic conditions exist which necessitate the operation of agricultural machinery by means of as cheap power as is possible. The cheapest fuel to use in any country is as a rule that obtainable in the country itself. We have such a fuel in this Colony—"Wood." Wood is most economically utilised in the form of gas, and the development of the suction gas engine has to-day attained a very high standard. In connection with suction gas, it is of interest to note that numerous experiments are being made at the present time in many parts of the world on an efficient and cheap method of operating tractors for agricultural operations by means of this fuel.

The following is a short summary of an article which appeared in the June issue of the *Implement and Machinery*

Review on suction gas tractor trials in France. After a few remarks on the general question of cheaper fuels, the writer proceeds to state that:—

"During the past two or three years the Comité Central de Culture Mécanique, the Office National des Combustibles Liquides, the War Department and the various associations interested in the fuel problem have been encouraging makers to introduce suction gas plants for lorries and tractors, and after many demonstrations and experiments, there is reason to believe that the suction gas vehicle has now entered upon a commercial stage. Some vehicles have been running thousands of miles with a view of proving the reliability and economy of wood and charcoal suction gas plants. There are obviously certain disadvantages in using wood. It means a heavier plant with particularly efficient scrubbers and purifiers for eliminating the tar products, and although waste wood is employed in industrial plants, it is found that for motor vehicles the wood must be cut up in special sizes, and supplies for any ordinary journey occupy too much space. Suction gas is, therefore, only practical for lorries and tractors when it is produced from charcoal, and the main object of the demonstrations is to encourage makers to perfect portable carbonising apparatus so that anyone will be able to produce charcoal of good quality from any kind of wood at low cost. Such apparatus would solve completely the fuel problem so far as concerns tractors and agricultural vehicles."

During the Congress held at Blois in May of this year it was shown that the tractor design has now reached such a state of perfection that it undoubtedly provides the farmer in Europe with the cheapest form of motive power for all agricultural operations, and with the advent of an efficient portable carbonising apparatus the use of the cheapest available fuel is possible, as any kind of brushwood or waste wood, otherwise of no value, can easily be converted into charcoal. It is stated that:—

"On previous occasions some makers had presented industrial carbonising plants of large capacity and of a somewhat complicated character with a view of reducing the cost of the operation by recuperating products, but in many cases the results were not good, and certainly these big plants did

not fall in with the aims of the organisers of the demonstrations, who sought to encourage the designing of portable and efficient apparatus which could be carried about and erected anywhere and operated by unskilled labour. At Blois these ambitious efforts at mechanically carbonising wood were lacking, and every maker showed apparatus of a really practical character, generally based upon the methods of the professional charcoal burner, which, obviously, are the safest to follow at this early stage of the new industry."

A general description of the eight carbonising systems shown is given. All function upon the same principles, the idea being to secure *automaticity* by utilising the inside temperature as a means of limiting or suppressing the introduction of air when the wood is incandescent.

A short description of one of these carbonising plants is of interest:—

"The 'Hexa' carboniser, constructed by Monsieur E. L. Barbier, 6, Rue de Madrid, Paris, has double cylindrical walls of steel plate, with outer apertures near the top and inside apertures near the bottom. The central chimney is also perforated near the bottom. When the wood is lighted the draught up the central chimney draws in air from the outside, which passes down the double walls, through the bottom holes inside. As soon as the temperature of the walls rises, that is to say, when the carbonisation is well advanced, the expansion of hot air between the walls prevents the admission of fresh air. Most of the carbonisers are of circular form, with the idea of avoiding deformation through changes of temperature, and are built up with either circular or vertical sections, so that they can be quickly dismantled and easily re-erected in any convenient place where there is wood to be carbonised. The circular sections fit into each other without connections, and the vertical plates are assembled with slotted pins and wedges. The sections are of double plates filled in with sand, clay or other more or less non-conducting material."

In the course of the Blois demonstration, the point arose as to the most convenient form in which charcoal could be utilised in suction gas tractors. The natural form is not the most convenient.

"At the exhibition in Blois charcoal was shown compressed in small blocks, and the only thing to be considered is the cost of this transformation into a handy fuel, for it is obvious that nothing must be done to increase appreciably the cost of charcoal. In the Forest of Menars small charcoal blocks were shown, prepared in a way that did not materially increase the price of the fuel. The powdered charcoal was simply mixed with a small proportion of clay and pressed. There are obviously many ways of preparing charcoal blocks with a cheap binding material, and this will doubtless occupy the attention of makers of light mechanical presses."

The article also deals with the necessity for a suitable wood-cutting machine, capable of bundling as well, which will operate on light brushwood and undergrowth. A portable circular saw, operated by a small air-cooled engine, is described. The cutting is effected in such a way that no heat is generated which would prevent the subsequent growth of the brushwood. One or two other similar machines are mentioned:—

"While the demonstration was largely devoted to the production of charcoal in the Forest of Menars, the exhibition of suction gas producers in Blois showed that a great deal of progress is being made with the application of charcoal to the running of heavy motor vehicles. Eleven firms also ran lorries on suction gas between Blois and the Forest of Menars, and a road roller belonging to the Municipality of Blois was equipped with a suction gas plant. In the Forest of Menars a Baldwin petrol locomotive was running on suction gas, and a Fordson tractor fitted with a Malbay producer created a very favourable impression by the way in which it ploughed up an adjoining field."

The article concludes with the statement that:—

"The trials are to be continued by the Ministry of War, which is organising a particularly severe test of motor vehicles running on suction gas. Already more than 40 vehicles have been entered. In the coming autumn suction gas lorries and tractors will also run from Tunis across North Africa to Casablanca with the aid of charcoal produced by portable carbonisers along the route."

It will be seen from the above that although a great deal has already been effected in regard to suction gas tractors

and lorries, the field of research in this direction is very wide, and the introduction of such tractors in this Colony will undoubtedly call for further research work in order that their design may be made to conform with such conditions as exist here.

P. H. Haviland,
Assistant Irrigation Engineer.

Smithfield Prices.

Messrs. Hart, Harrison & Co., 4 and 5, West Smithfield, London, kindly supply the following prices ruling on 14th July:—

London Central Markets:—Beef.—Moderate supplies of fresh killed and chilled; good steady demand; prices firm.

English long sides, $8\frac{1}{2}$d. to $9\frac{3}{4}$d. per lb.
Argentine chilled hinds, $6\frac{3}{4}$d. to $7\frac{1}{2}$d. per lb.
Argentine chilled fores, $3\frac{3}{8}$d. to $3\frac{5}{8}$d. per lb.
Uruguayan chilled hinds, $6\frac{1}{4}$d. to $6\frac{1}{2}$d. per lb.
Uruguayan chilled fores, $3\frac{1}{8}$d. to $3\frac{3}{8}$d. per lb.

Cowpeas.

By F. C. Peek, Teign, Concession.

Some years ago my attention was called to this valuable legume by a pamphlet written by Mr. W. Pepworth, giving his experiences of their growth in Natal; and as very little has been written about the cowpea in the *Rhodesia Agricultural Journal* during the last 20 years, I am taking the liberty of giving a few of my own personal experiments with it. They do not pretend to be those of an expert, and my chief reasons are that there has been an erroneous idea locally that we cannot successfully grow cowpeas—at any rate in my district—an idea rather fostered by a few local failures, and I think through lack of success by our agriculturists at the experiment station. I imported the New Era cowpea a few years ago from the Union, and have made quite a success with this seed, and the few local farmers who have taken my advice have also been successful. I will now give readers of the Journal what I consider has always been the chief cause of failure, and that is, too early planting. I never plant before the second or third week in January for seed, but one can plant a little earlier for green manuring. It is usually possible to plant up to the middle of February, and I have on two occasions successfully planted as late as the beginning of March. The reasons for this late planting are that the flowers do not set during the very heavy rains such as we usually get in February; the leaves also are liable to rust and fall, and the bean stem maggot does considerable damage at times. From the time of flowering, the cowpea requires very little rain. I plant with the ordinary maize planter 27 ins. between the rows and 6 ins. to 8 ins. apart, and I think 12 to 15 lbs. of seed are required per acre. At this distance I find the Fowler cultivator the most suitable machine to use, and two cultivations are usually sufficient. The plant should appear above ground in five or six days

and the rows grown over in seven to eight weeks. Nearly all weeds are then smothered, with the exception of rapoko grass, which appears to beat most smothering crops.

On my farm cowpeas have grown well on red diorite soil and the lighter red and grey felsite prevalent in this district, and I have no reason to doubt that they will do equally well on lighter sandy types of soil. As a green manure I consider this legume has no equal for supplying humus, and the roots will usually be found to bear a mass of nitrogen nodules. Unlike velvet and dolichos beans, the vines of which choke the plough discs, it is very easily turned under. Even after a crop has been fed down I have brought worn maize lands from four bags to twelve without fertiliser. It does well planted with maize for ensilage. Cut as hay, the cowpea is well known to be one of the most valuable feeds for milk cows, and my own experience lately has been a great improvement in cream after feeding it. Cattle are so fond of it that I have found oxen horning it out of the ground after ploughing under. It is an excellent pig feed, and I use the grain mixed with crushed maize with good results. It is also a good poultry food. As a ration for natives it is a useful asset on the farm and preferred to most beans. Housewives will find it gives a nice flavour in soups.

Mr. Pepworth mentions the cowpea as an eliminator of one of the greatest curses of the maize grower, i.e., witch weed, which takes a bigger toll of our grain than most farmers are aware of. I cannot say definitely if this is so in Rhodesia, but have noticed this season (one particularly bad for witch weed) that none appeared in a field after cowpeas where previously it had been noticed. Possibly our agriculturists could enlighten us on this point. The chief local pests of the cowpea appear to be the bean stem maggot, the blister beetle, the cotton jassid and the bean weevil. There may be others that have not come to my notice. The blister beetle, as with all beans, damages the flower considerably. The bean weevil is particularly bad in the grain, being softer than most beans, and quickly bores through the peas. However, it never appears to destroy the germ, and a couple of handfuls of lime thoroughly mixed in a bag of seed will entirely eliminate the pest. I accidentally discovered the fondness of the jassid for this plant through

planting it between cotton. They appeared to leave the cotton for the cowpea, and curled up most of the leaves of the latter. The jassid was again found this season, when no cotton was grown here, but little damage was done.

These are entirely a few of my personal experiences, and in relating them I feel they possibly may not agree with the opinions of our agriculturists on some points. At the same time I am convinced that both maize growers and stock owners should give a thorough trial to this valuable legume, and they will not regret it.

COMMENT BY AGRICULTURIST.

Mr. C. Mainwaring, Agriculturist, comments as follows on the foregoing:—

Mr. Peek's interesting and instructive notes on the cowpea (or kaffir bean) are welcomed, as we are always glad to receive such useful information from practical farmers. From his remarks, however, he appears to be under the impression that the agricultural advisers do not encourage the cultivation of this valuable food and forage crop as much as they might do; he can be assured that such is not so.

During recent years the Department of Agriculture has distributed free seed to farmers throughout the Colony of numerous samples of the following varieties:—Iron, Whipporwill, Clay, Black, Red Ripper, Taylor, Wonderful, New Era, Victor, Monetta and Brabham, and is also introducing and testing new varieties annually at the Salisbury Agricultural Experiment Station. On account, however, of the attacks of the stem maggot in some localities, all farmers have not met with Mr. Peek's success.

His experience with witch weed on old maize lands following cowpeas is interesting and valuable from a practical point of view, as it offers some sort of possible relief from the pest. The danger to avoid is that of being led away by false appearance of relief. In Mr. Peek's case, as in that of many similar infestations, apparent relief is noticed when the host crop is kept off the infested lands and another crop substituted. Then the witch weed disappears, the reason being that its particular host is absent and it does not parasitise

on the plants of the new crop. There is no real relief, for when the host (maize) crop is again planted on the land the pest may be as bad as ever, for the simple reason that the seeds live on in the ground and germinate when the conditions are favourable.

Farm Foods and Fertilisers.

The attention of manufacturers, importers and vendors of farm foods is drawn to Government Notice No. 132, 19th March, 1920, setting forth the regulations dealing with the registration and sale of farm foods and fertilisers.

It should be noted that under these regulations every fertiliser or farm food intended for sale within the Colony of Southern Rhodesia shall, before sale, be registered with the Secretary, Department of Agriculture, in terms of these regulations, and that until registration is effected the sale of the above-mentioned products is illegal.

W. A. Devine,
Acting Secretary,
Department of Agriculture.

Report on the Southern Rhodesia Egg-Laying Test

AT THE GOVERNMENT EXPERIMENT STATION, SALISBURY.

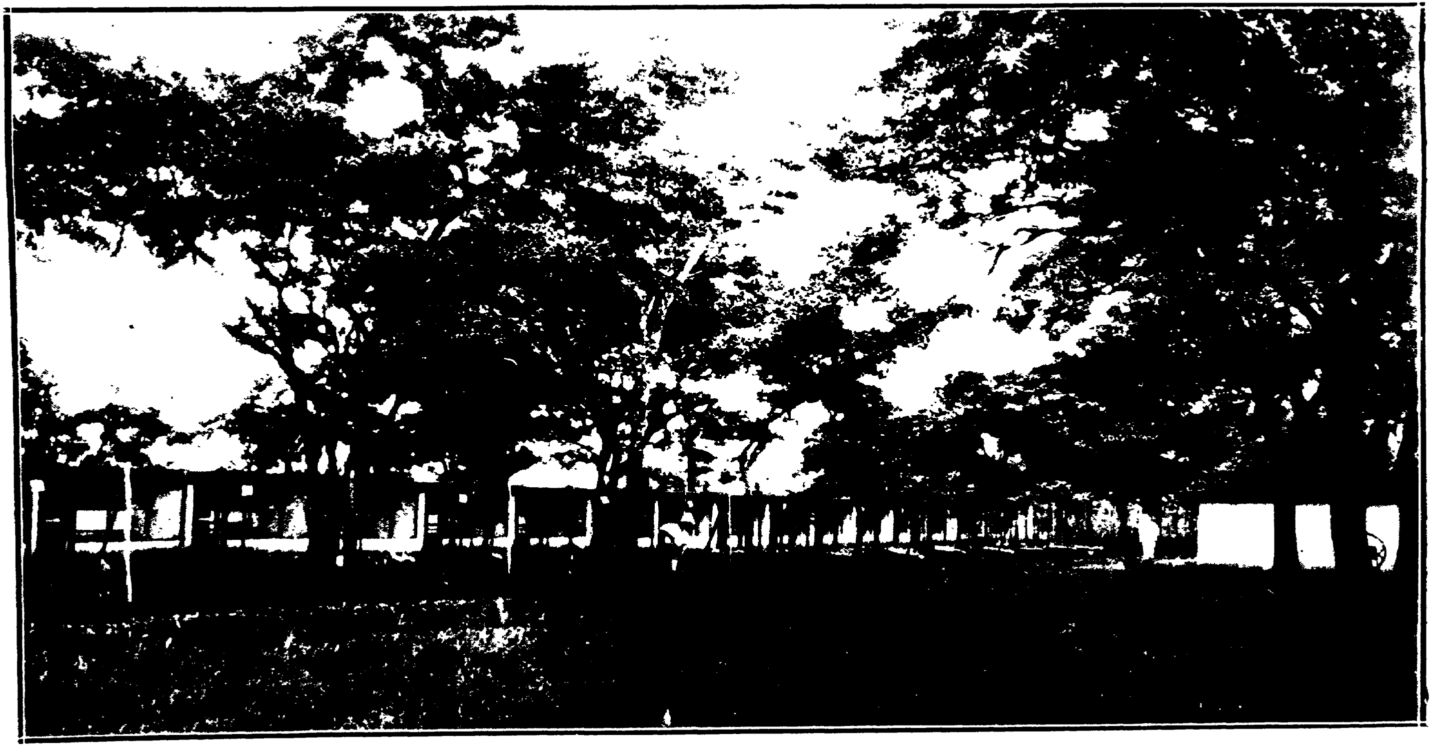
SEVENTH YEAR'S RESULTS.

1st *March*, 1926, *to* 30th *January*, 1927.

By H. G. WHEELDON, Assistant Poultry Expert.

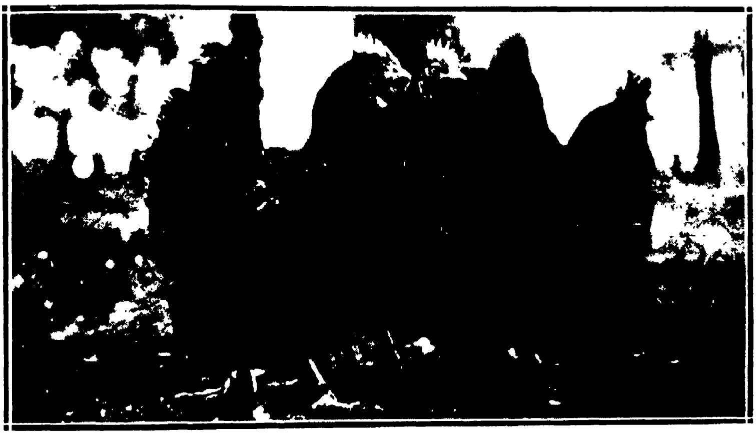
The seventh egg-laying test closed at the Government Experiment Station, Salisbury, on the 30th January, 1927. The control and conditions governing this test were similar to those of the previous competitions, and started four weeks after the close of the preceding test. For the first 10 weeks first grade eggs were counted 1¾ ozs. and over, and for the remaining 9½ months eggs 2 ozs. and over were counted as first grade. Positions are calculated on the weight of 2 ozs. and over. In some respects good results were achieved, and generally the year's data compare favourably with any yet secured.

The weather experienced during this test was very changeable. During the winter months it was frosty, with frequent cold variations of cloudy weather accompanied by south-easterly winds with some rain. This was followed by very hot dry weather for several months, which proved to have a somewhat adverse effect on egg production. During the belated rainy season also the weather was variable and abnormally hot. It is attributable to these conditions that many of the birds were periodically affected during the test by the moult. Thus, from the point of view of records in egg production, this test is not considered to be as good generally as it might have been.



General view of the poultry houses at the Southern Rhodesia egg-laying test, Salisbury.

Pen 2. Rhode Island Reds. First in heavy breed section; owners, Messrs. F. C. Trueman & Sons, Johannesburg.



Pen 6. Austral Orpingtons. Second in heavy breed section: owner, Mr. R. Porritt, Maritzburg, Natal.

Pen 4. Austral Orpingtons. Third in heavy breed section: owner, Mr. P. Sim, Salisbury.

Pen 20. White Leghorns. First in light breed section; owner, Mr. A. M. Burke, Claremont, C.P.

Pen 13. White Leghorns. Second in light breed section; owner, Mr. Sam Stewart, Premier Mine, Transvaal.

Pen 16. White Leghorns. Third in light breed section; owner, Miss M. V. Toussaint, Salisbury.

Monthly records were issued to all competitors and were published in the newspapers throughout Southern Rhodesia and also in the *Rhodesia* and *South African Poultry Magazines* and the *Farmers' Weekly.*

These annual competitions serve, among other things, as a guide to would-be purchasers of eggs for settings or stock birds, and what might be expected in the way of egg production from certain strains. They also impress upon poultry breeders the necessity for hatching at the right time of the year for intense egg production. Readers and competitors will have this fact brought home to them by studying the monthly reports.

The breeds represented in the various sections were as follows:—

Heavy breed section.	Number of pens.	Number of birds.
Rhode Island Reds	2	10
Black Orpingtons	4	20
White Wyandottes	1	5
Light breed section.		
White Leghorns	13	65

There were 90 birds trap-nested in this test, of which 33 produced over 200 eggs in 48 weeks. The best individual records of each of the breeds are:—

Rhode Island Red.—Hen No. 10, pen 2: Total number of eggs laid in 48 weeks, 241; weight, 34 lbs. 3 6-16 ozs.; total number of 2 oz. eggs and over, 240. This was the best individual record of eggs weighing 2 ozs. and over in the heavy breed section. The bird is the property of Messrs. F. C. Trueman & Sons, Johannesburg.

Australian Black Orpington.—Hen No. 16, pen 4: Total number of eggs laid in 48 weeks, 237; weight, 29 lbs. 13 9-16 ozs.; total number 2 ozs. and over, 191 eggs. Owned by Mr. P. Sim, Salisbury.

White Wyandotte.—Hen No. 22, pen 5: Total number of eggs laid in 48 weeks, 189; weight, 24 lbs. 8 7-16 ozs.; total number 2 ozs. and over, 176 eggs. Owned by Miss M. V. Toussaint, Salisbury. The best White Wyandotte on the previous test also belonged to Miss Toussaint.

White Leghorn (1).—Hen No. 50, pen 10: Total number of eggs laid in 48 weeks, 259; weight, 31 lbs. 8 4-16 ozs.;

total number of 2 ozs. and over, 181 eggs. Owned by Mr. K. W. Rowell, Umtali. The best White Leghorn record last year was 262 eggs. Owner, Mr. Rowell.

White Leghorn (2).—Hen No. 98, pen 20, was the best layer of 2 oz. eggs and over in the light breed section, namely, 252 eggs. Owner, Mr. A. M. Burke, Claremont, C.P.

The analysis of the egg production of the trap-nested breeds is shown in the following table:—

	White Leghorns.	Rhode Island Reds.	White Wyandottes.	Austral Orpingtons.
Under 50	—	—	—	—
51—100	—	2	1	2
101—150	4	2	1	4
151—180	7	2	1	3
181—200	22	3	2	3
201—220	8	—	—	4
Over 220	14	1	—	4

In bringing the results of all the tests up to date, a comparison of the results from the 100 birds in each of these tests and the best individual records is of interest.

Total Number and Weights of Eggs.

Year.	Duration.	2 ozs. and over.	Under 2 ozs.	Total.	Weight.
	Weeks.				lbs. ozs.
1920-21	45	15,208	2,859	18,067	2,361 $14\frac{13}{16}$
1921-22	48	14,632	2,743	17,375	2,266 $10\frac{9}{16}$
1922-23	48	12,730	2,097	14,827	1,924 $11\frac{5}{16}$
1923-24	48	15,392	2,717	18,109	2,372 $14\frac{9}{16}$
1924-25	44	16,577	1,356	17,933	2,387 $8\frac{2}{16}$
1925-26	48	17,210	1,761	18,971	2,533 $3\frac{1}{16}$
1926-27	48	16,284	2,272	18,556	2,454 $8\frac{4}{16}$

Year.	Hen No.	Duration.	2 ozs. and over.	Under 2 ozs.	Total.	Weight.	
		Wks.				lbs.	ozs.
1920-21	63 White Leghorn	45	256	8	264	33	$15\frac{1}{16}$
1921-22	4 White Wyandotte	48	197	25	222	28	$1\frac{9}{16}$
	55 White Leghorn	48	243	6	249	33	$9\frac{8}{16}$
1922-23	27 Rhode Island Red	48	171	2	173	23	$1\frac{10}{16}$
	75 White Leghorn	48	229	1	230	30	$9\frac{2}{16}$
1923-24	8 Black Orpington	48	120	114	234	28	$5\frac{2}{16}$
	76 White Leghorn	48	254	...	254	34	$5\frac{8}{16}$
1924-25	8 Black Orpington	44	241	2	243	33	$9\frac{15}{16}$
	54 White Leghorn	44	241	18	259	32	$14\frac{13}{16}$
1925-26	27 Black Orpington	48	104	133	237	28	$1\frac{4}{16}$
	44 White Leghorn	48	32	230	262	29	$1\frac{11}{16}$
1926-27	10 Rhode Island Red	48	240	1	241	34	$3\frac{6}{16}$
	50 White Leghorn	48	181	78	259	31	$8\frac{4}{16}$
	98 White Leghorn	48	252	6	258	34	$2\frac{1}{16}$

A few remarks relating to the three leading pens in each of the heavy and light breed sections might here be made.

Heavy Breeds.—Messrs. F. C. Trueman & Sons' (Johannesburg) winning pen of Rhode Island Reds produced 985 eggs, five of which were under 2 ozs. These birds were a little small if judged according to exhibition requirements, but they handled heavier than they looked. They were good symmetrical birds and represented the breed in this respect, with neat, fine heads, while they were hardy and active. They were, however, weak in colour; some of them were chocolate, and others carried excessive smut in under-colour

and black ticking in the surface of the wings. These birds arrived in excellent condition. They were considered to be a little young on arrival, but they soon filled out and commenced to lay. At the end of the first period their position was last but one; during the second period they gained third position, and they worked up to first place in the third period. They then maintained this position throughout the test. They proved to be consistent layers, alert, and had good health throughout. When they showed signs of broodiness it was very easy to break them of it. It was this fact, combined with their stamina and excellent laying qualities, which materially assisted them in maintaining the winning position. The best pullet in this pen produced 241 eggs. The average per bird was 197 eggs.

Mr. R. Porritt's (Maritzburg) pen of Austral Orpingtons obtained second place. With the exception of one of the pullets, they were of the same type as last year's winners. They were of standard size and fairly closely feathered. They produced 943 eggs, 31 of which were under 2 ozs. They were leading during the first period; they then dropped to second and third positions during the second and third periods respectively. One pullet commenced to moult, and the others were rather susceptible to broodiness during the third period. Thereafter pullet No. 27 was an inconsistent layer and in bad health, and was a handicap to an otherwise excellent pen. It was during the eighth period this pen gained second place and which position they maintained. They were fairly low, compact birds, with neat heads, and not the least heavy in appearance, with good quality generally. One bird died, which was replaced. The best pullet produced 227 eggs. Average per bird, 188.6 eggs.

Mr. P. Sim's (Salisbury) pen of Austral Orpingtons secured third position. They produced 943 eggs, 61 of which were under 2 ozs. This pen consisted of birds which were light in type for the breed, and were loosely feathered, especially two of them. Unfortunately three deaths occurred, which meant fresh birds to replace them. During the first and second periods they held fourth position, and then they laid consistently and gained second place, which they held for five periods; they dropped to third position during the eighth period. The best pullet in this pen produced 237 eggs. Average per bird, 188.6 eggs.

Austral Orpington pullet No. 30, owned by Mr. R. Porritt, Maritzburg, Natal: 220 2 oz. and over eggs in 48 weeks.

Rhode Island Red pullet No. 10, owned by Messrs. F. C. Trueman & Sons, Johannesburg: 241 eggs in 48 weeks.

White Wyandotte pullet No. 22, owned by Miss M. V. Toussaint, Salisbury: 189 eggs in 48 weeks.

White Leghorn pullet No. 98, owned by
Mr. A. M. Burke, Claremont, C.P.:
258 eggs in 48 weeks.

White Leghorn pullet No. 50, owned by
Mr. K. W. Rowell, Umtali:
259 eggs in 48 weeks.

Light Breeds.—Mr. A. M. Burke's (Claremont) winning pen of White Leghorns were rather light, but active and hardy. They were closely feathered, neat and of good quality generally, with bright appearance. They had good health throughout. This pen arrived several days late, and they did not get a very good start. They held sixth place during the first period, then fourth and second positions. During the fourth period they gained first place, and they maintained this position throughout the rest of the test. All the pullets were very consistent layers and produced 1,169 eggs, 82 of which were under 2 ozs. The best pullet produced 258 eggs. Average per bird, 233.8 eggs.

Mr. Sam Stewart's (Premier Mine, Transvaal) pen of White Leghorns were second. The birds in this pen were of standard size and admirable type. Two or three were suitable for exhibition purposes. It is fair to state that this pen, with three or four other pens, had considerable misfortune owing to the birds being affected periodically by the moult. They moulted on arrival, and at the end of the first period they held seventh position. They recovered sufficiently and laid well and attained fourth place, which they held during the third and fourth periods. During the fifth period three pullets again commenced to moult, and the pen in consequence fell back to eighth place. The birds made a fresh recovery and gradually gained second place, which position they held during the last two periods. They produced 973 eggs, 34 of which were under 2 ozs. This pen consisted of a uniform set of pullets, possessing good quality and stamina. The best pullet produced 240 eggs. Average per bird, 194.6 eggs.

Miss M. V. Toussaint's (Salisbury) pen of White Leghorns obtained third place. These pullets proved to be consistent layers and held a high position throughout the test. They were very much the same type as the second pen. They were first during the second period, and owing to one bird going into a partial moult, the pen dropped to third position during the third and fourth periods. They gained second place during the fifth period, and held this position for six periods, and it was during the eleventh period they again dropped to third place. It was unfortunate that two deaths occurred in this pen during the latter part of the test from ovary troubles. One of these birds laid one egg during the

two months before she succumbed. They produced 1,010 eggs, of which 56 were under 2 ozs. The best pullet produced 234 eggs. Average per bird, 202 eggs.

Value of Food Consumed.

Foodstuffs.	Weight.	Cost.
Bran	1,300 lbs.	£8 2 6
Pollard	1,350 lbs.	6 18 0
Mealie meal	900 lbs.	3 2 6
Meat meal	300 lbs.	2 16 0
	3,850 lbs.	£20 19 0
Crushed mealies	4,500 lbs.	£15 12 6
Sunflower seed	800 lbs.	4 12 0
Munga	1,400 lbs.	6 2 6
Linseed	10 lbs.	0 8 4
	6,710 lbs.	£26 15 4
Charcoal	280 lbs.	£0 18 0
Oyster shell	450 lbs.	4 9 0
Grit	250 lbs.	1 5 0
	980 lbs.	£6 12 0

Green vegetables—248¼ bags at 1s. 3d. and 1s. 6d. per bag, £17 1s. 6d.

Milk—691 gallons at 6d., £17 5s. 6d.

Medicine, disinfectants and appliances, £8 0s. 5d.

Feeding.—One of the aims of the competition is to demonstrate that egg production is not confined to the feeding of the fowls on a special grain or even a limited number of grains. The food suitable for egg production extends over a very wide range, and as previously mentioned, poultry keepers to be successful should utilise that particular grain or product of a district which is cheapest as a foundation food and make use of other foods with the staple grain to form what is termed a "balanced ration." With this object in view, grains such as wheat, oats, kaffir corn and buckwheat have been eliminated owing to the difficulty in obtaining a regular supply and also on account of their prohibitive cost generally. It will be seen that maize, munga (inyati)

and sunflower seed constitute the grain mixture. These grains can be produced or are readily available in practically all the districts in this Colony. Maize is the staple grain, with which may be incorporated either munga or sunflower or both to form a grain mixture. The bye-products of wheat should form the basis of the mash mixture. Although these are not produced to any great extent, the supply can be readily supplemented at a reasonable cost by importations.

A perusal of the food list will show that a fairly large quantity of skimmed or separated milk was consumed by the birds, and the same applies also to the green food. The latter is fed to the birds twice a day. Skimmed milk is regarded as an important addition to the diet of poultry, more particularly for young growing stock. Green food is essential for all ages of stock.

Mortality.—There was one death from chronic bronchitis, eight from ovarian troubles, and three from the rupture of the hepatic artery.

MONTHLY RECORDS OF BEST LAYERS.

The following are the individual scores of the leading six hens in the light breeds, and of the leading six hens in the heavy breeds.

LIGHT BREEDS.

Owner.	Breed.	Hen No.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	Total.
K. W. Rowell, Umtali ...	White Leghorns	50	24	24	24	24	23	24	24	25	24	21	22	259
A. M. Burke, Claremont, C.P.	,,	98	8	25	25	22	23	27	25	26	23	28	26	258
W. A. Bull, Umtali ...	,,	90	18	22	21	22	23	23	21	22	24	26	21	243
S. Stewart, Premier Mine, Transvaal	,,	63	8	23	23	23	26	24	24	24	24	22	19	240
A. M. Burke, Claremont, C.P.	,,	96	16	24	25	20	21	25	26	23	18	20	22	240
A. M. Burke, Claremont, C.P.	,,	100	21	21	21	19	23	21	24	24	23	23	19	239

HEAVY BREEDS.

Owner.	Breed.	Hen No.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	Total.
F. C. Trueman & Sons, Johannesburg	R.I. Reds	10	17	29	31	27	29	27	26	30	24	1	—	241
P. Sim, Salisbury ...	Aust. Orpingtons	16	14	20	23	25	25	23	23	22	27	14	21	237
R. Porritt, Pietermaritzburg	,,	30	22	24	25	23	19	21	23	19	15	21	15	227
Mrs. A. M. Hunter, Glen Douglas, P.B. Salisbury	,,	34	24	14	4	24	23	23	23	27	21	23	18	224
P. Sim, Salisbury ...	,,	17	24	22	24	19	20	20	19	23	21	13	17	222
Mrs. A. M. Hunter, Glen Douglas, P.B. Salisbury	,,	35	21	20	23	23	23	23	22	17	18	16	11	217

MONTHLY PRODUCTION, 1926-27.

Month.	LIGHT BREEDS. Total for 65 hens.		LIGHT BREEDS. Average No. of eggs per hen.	HEAVY BREEDS. Total for 35 hens.		HEAVY BREEDS. Average No. of eggs per hen.
	No. of eggs.	Weight.		No. of eggs.	Weight.	
1926—March ...	794	94 lbs. $8\frac{12}{16}$ ozs.	12.22	585	72 lbs. $9\frac{14}{16}$ ozs.	16.71
April ...	1,161	144 lbs. $6\frac{10}{16}$ ozs.	17.86	614	79 lbs. $10\frac{2}{16}$ ozs.	17.54
May ...	1,000	130 lbs. 11 ozs.	15.38	478	63 lbs. 9 ozs.	13.66
June ...	978	130 lbs. $13\frac{3}{16}$ ozs.	15.05	460	62 lbs. $14\frac{9}{16}$ ozs.	13.14
July ...	1,201	162 lbs. $6\frac{7}{16}$ ozs.	18.48	632	88 lbs. $10\frac{10}{16}$ ozs.	18.06
August ...	1,409	188 lbs. $6\frac{2}{16}$ ozs.	21.68	670	93 lbs. $13\frac{8}{16}$ ozs	19.14
September	1,371	180 lbs. $2\frac{6}{16}$ ozs.	21.09	612	85 lbs. $8\frac{11}{16}$ ozs	17.49
October ...	1,301	163 lbs. $2\frac{1}{16}$ ozs.	20.02	558	75 lbs. $8\frac{1}{16}$ ozs.	15.94
November	1,278	166 lbs. $7\frac{11}{16}$ ozs.	19.66	499	70 lbs. $9\frac{4}{16}$ ozs.	14.26
December	1,188	156 lbs. $8\frac{2}{16}$ ozs.	18.28	405	58 lbs. $3\frac{3}{16}$ ozs.	11.57
1927—January ...	1,021	136 lbs. $12\frac{4}{16}$ ozs.	15.71	341	49 lbs. $3\frac{6}{16}$ ozs.	9.74
	12,702	1,654 lbs. $4\frac{10}{16}$ ozs.		5,854	800 lbs. $4\frac{4}{16}$ ozs.	

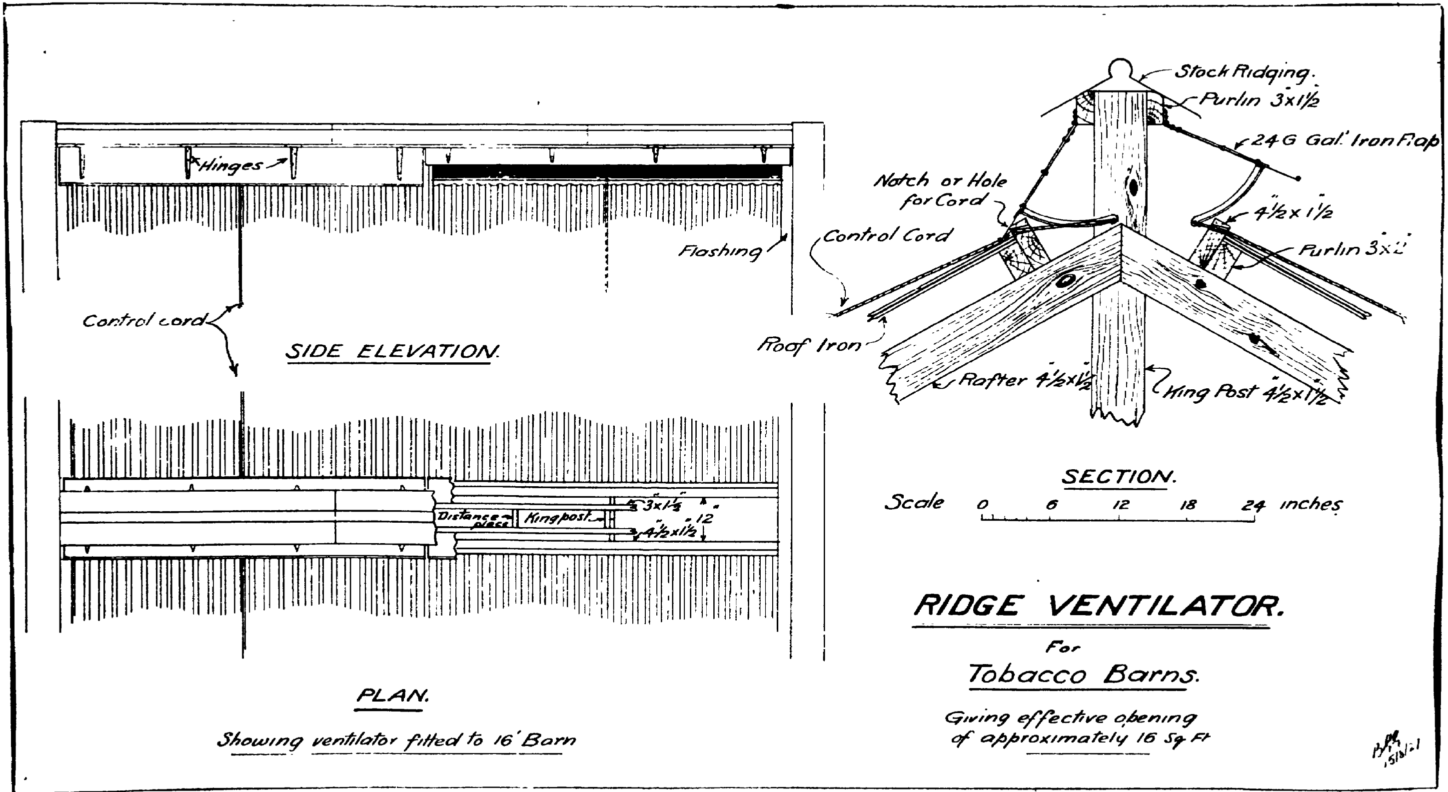
Ridge Ventilator for Tobacco Barns.

By B. G. GUNDRY, Irrigation Branch.

The flap type of ridge ventilator is becoming very popular among successful tobacco growers and is strongly recommended by the Tobacco Advisers. The design shown in the accompanying drawing has the advantage that it can be readily adapted to an existing barn, as well as being simple to construct in a new one. As will be seen, the use of timber has been reduced as far as possible to a minimum, since with the enormous variation in temperature and humidity it is likely to give considerable trouble by warping and twisting.

In this design the king posts of the roof principals are carried up approximately 12 ins. above the apex of the rafters, and to the top of these are attached, by bolts or screws, two lengths of 3 ins. x 1½ ins. timber running the full length of the roof to act as purlins. Midway between each pair of king posts, a distance piece, consisting of a short length of timber 4½ ins. x 1½ ins., should be bolted between these purlins to give additional stiffness and to prevent warping. Ordinary stock ridging is secured to the upper edge of these purlins, to which the flaps are also attached by means of 10-in. tee hinges. The flaps are made from 24-gauge flat galvanised iron, the edges of which should be turned over on a length of stout fencing wire to give them the necessary stiffness.

The drawing shows two flaps 8 ft. long fitted to a 16 ft. barn, but it will be observed that the flaps may be of any convenient number, as their length is quite independent of the spacing of the roof principals. Three flaps approximately


Stock Ridging.
Purlin 3x1½
24 G Gal. Iron Flap
4½x1½
Purlin 3x2
Notch or Hole for Cord
Control Cord
Roof Iron
Rafter 4½x1½
King Post 4½x1½
SECTION.
Scale 0 6 12 18 24 inches
Hinges
Flashing
Control cord
SIDE ELEVATION.
Distance piece
Kingpost
3x1½
4½x1½
12
PLAN.
Showing ventilator fitted to 16' Barn
RIDGE VENTILATOR.
For
Tobacco Barns.
Giving effective opening
of approximately 16 Sq Ft

5 ft. 4 ins. long might be preferred, as the iron in an 8 ft. flap would have to be joined, since this iron is only obtainable locally in 6 ft. sheets.

To each flap an actuating arm made of light angle iron or of some other convenient section is bolted or rivetted. The cord or flexible wire cable for controlling the flap is attached to the end of this arm and may pass either over a sheaf pulley and down inside the barn or it may be taken through a hole or notch in the 4½ ins. x 1½ ins. longitudinal timber, on which the flap closes, just above the roof iron. From there it is carried down over the roof to the ground, but must be protected from chafing on the guttering by a smooth, wooden block or pulley. By this means the ventilators are regulated from outside the barn and the position of same can be easily observed.

The flaps should be prevented from opening too far by means of a short length of chain or reim, and when fully open should have sufficient downward slope to throw the rain off. At each end of the roof and between the flaps, which should have only sufficient clearance at their ends to permit them to work freely, the 4½ ins. x 1½ ins. timber should be checked out for a few inches to allow a strip of roof iron to go well up under the ridge to prevent the entry of rain. At the end of the barn, where there is no dividing wall, the end of the ridge must be rendered sufficiently air-tight by nailing up boards or a piece of sheet iron cut to the necessary shape.

When building this ventilator on to an existing barn it is only necessary to bolt a short extension on to each king post and to lower the top purlins down the rafters sufficiently to allow a clear space of at least 12 ins. between the two lengths of 4½ ins. x 1½ ins. timber when they are laid above the purlins. The roof iron must, of course, be either cut off or slid down so that its upper edge is flush with the purlin. This having been done, the construction of the ventilators can proceed as already described.

The quantities of material required to fit a ventilator to one 16 ft. barn, together with the approximate cost of same, are given below:—

Material.	Size or section.	Quantity.	Approximate cost.		
Timber for purlins	3″ x 1½″	32′	£0	7	0
Timber for king posts, distance pieces, and longitudinals	4½″ x 1½″	50′	1	4	0
Flat galvanised iron	24 G.	3 sheets	0	18	0
"T" hinges	10″	16	1	0	0
Bolts	8″ x ⅜″	14	0	3	6
Flat or angle iron for actuating arms		6′	0	3	0
Screws and nails			0	2	6
Ridging—replaced			—		
	Total		£3	18	0

NOTE.—*At one time it was anticipated that drawings of a sliding type of ridge ventilator would be published, and various growers were advised accordingly. It has since been decided, however, to abandon this design owing to the difficulty of providing sufficient area of opening at a reasonable cost.*

Maize Competition.

The competition was open to maize growers throughout the Colony, and entries were received from growers in all the different districts. Each plot entered measured 140 yards by 70 yards, and the competition plots were measured and the yields obtained checked.

The following is a list of the winners:—

	Name.	District.	Plot Yield.
1.	D. C. Forbes	Enterprise	63 bags and 26 lbs.
2.	Macdonald Bros.	Inyazura	60 bags and 143½ lbs.
3.	E. H. South	Salisbury	60 bags and 124 lbs.
4.	H. B. Christian	Enterprise	60 bags and 122½ lbs.
5.	E. G. Jackson	E. Fort Victoria	60 bags and 23 lbs.
6.	W. A. Ludgater	Poorti Valley ...	59 bags and 60 lbs.
7.	D. C. Forbes	Enterprise	57 bags and 104 lbs.
8.	Graham Bros.	Shamva	56 bags and 167 lbs.
9.	Wheeler Bros.	Salisbury	56 bags and 88 lbs.

All the returns sent in have been classified, and the result shows that Salisbury White seed, with the exception of the plot grown on alluvial soil by Messrs. Macdonald Bros., has secured all the prizes, three of these being claimed by the Enterprise district, two by Salisbury and one each by Eastern Fort Victoria, Poorti Valley and Shamva.

A closer examination shows that these Salisbury White winning plots were, with one exception, on red or chocolate diorite soils, the exception being that of Messrs. Wheeler Bros., which has been classed as black alluvial vlei or black turf soil.

In the group of returns from the 10th to the 21st plots Glendale appears nine times, mostly with Hickory King, the yields in this area varying from a maximum of 54 bags 193 lbs. to a minimum of 49 bags 122 lbs. in the eleven plots. This is a most remarkable uniformity and is in keeping with the well-known evenness of soil and lack of pockets in the Glendale area. The other two plots in this group are one of Mr. J. Rademeyer, Eastern Fort Victoria, and one of

Messrs. Wheeler Bros., Salisbury, which latter was unfertilised and taken as a control.

From this point to the end of the fifty-one plots analysed there is no characteristic which immediately strikes the eye, as all competing districts are represented at intervals in the "tail."

Where four returns or over have been sent from a single Farmers' Association area the results have been analysed, and the following averages have been obtained:—

Glendale Association	12 plots	50 bags 53 lbs. per plot
Enterprise Association ...	9 plots	49 bags 146 lbs. per plot
Salisbury Association	8 plots	48 bags 139 lbs. per plot
Marandellas Association ...	4 plots	29 bags 121 lbs. per plot
Rest of Rhodesia	17 plots	39 bags 142 lbs. per plot
Unploughed plot, Glendale	1 plot	34 bags 160 lbs.

It should be noted that in addition to the plots from which the average for Glendale was taken there was one plot —that of Mr. F. Webb—which had been planted on unploughed ground, and yielded 34 bags 160 lbs. The plot was marked out as being a representative portion of a fifty acre field similarly untreated, and was introduced into the competition for purposes of record.

The average yield under the heading "Rest of Rhodesia" includes four prize-winners from areas not sufficiently represented to permit of a summary being made.

It is to be regretted that an important maize district like Lomagundi was represented by only one competitor.

A further report is being prepared for publication.

Brick and Iron Settler's House at Chipoli.

[*The following notes and the accompanying illustration have kindly been supplied to us by Mr. J. M. Moubray.*—Ed.]

Roof: lean-to, centre wall. Walls 10 ft. to 12 ft. high. Rooms: Dining room, 18 ft. x 12 ft.; bedroom, 15 ft. x 12 ft. Verandah, 8 ft. Fireplace in dining room. Windows: double cottage casements, one at back and one at front of each room (through draught in hot weather). Back windows open inwards to allow of mosquito netting on outside. Mosquito netting all round outside of brick arches and mosquito door on to verandah. 20,000 bricks.

Roof: 42 sheets 10 ft. corrugated iron.
35 ft. ridging.
230 ft., 2 in. x 3 in.
8 pieces 10 ft. long, 4½ in. x 1½ in.
13 pieces 13 ft. long, 4½ in. x 1½ in.
21 pieces S X board, 6 ft. x 3 ft., for ceiling, nailed directly on to rafters. (This is a British product.)

Sixty feet of ceiling board cut into 1½-in. strips for ceiling. 100 ft. moulding for doors and windows. Three door frames—two panel doors and one mosquito door. Ten bags local cement for damp course and floors; the house is white ant proof.

House can be built in lime or good dagga. If lime, then 30 bags are required.

House built by native labour, supervised by settler. Cost of native labour, £10.

Importation of Cattle from England.

It is notified for the information of those interested that the Government of Southern Rhodesia is prepared to grant assistance to stock owners to import pedigree stock from Great Britain.

A sum of £20,000 has been voted for the purchase of pedigree animals.

A deposit of 25 per cent. of the estimated landed cost of the animals is required to be made by approved applicants. The Government will advance 75 per cent. of such cost.

The maximum loan will be:—

For purchase of pedigree bulls	£200
For purchase of female pedigree stock ...	£250

Arrangements will be made whereby the assistance of the staff of the High Commissioner's Office, London, will be offered to purchasers.

The purchasers would be without recurrence on the Government, which would act as agent only, the purchaser (or breeder) accepting all risks attendant upon purchase or delivery.

Up to the time of delivery to the shipping company the seller normally accepts all risks, including those attendant upon the tuberculin test in Great Britain.

Thereafter the stock purchased is at the risk of the purchaser, and such risk will apply to all veterinary or other tests to which the animals may be subjected in terms of the law or at the request of the owner.

The Government will attend on behalf of approved applicants to the payment of the purchase price, freight, railage, port dues, insurance and all other charges to Salisbury or Bulawayo, subject to the conditions as to deposit and maximum advance set out above.

If inoculation against red water or gall sickness at the Veterinary Research Station, Salisbury, is desired, this will be effected at the buyer's request and risk.

Repayment of the advance made by the Government will be spread over a period of five years.

Provided there is an adequate demand for his services, the Government is prepared to send its Stock Adviser (Mr. Fleming) to Great Britain to purchase suitable animals or to pass animals purchased by agents on behalf of breeders. Whilst in England the services of Mr. Fleming will be available for stock owners who desire to purchase pedigree animals without Government assistance.

Applications for assistance in terms of the foregoing should be addressed to the Secretary, Department of Agriculture, Salisbury.

Bee-Keeping in Rhodesia.

NOTES FOR SEPTEMBER.

By T. Savory.

By the time this issue reaches the apiarist of Rhodesia the chief month of the year for his work will be starting, and on this point items from Mr. E. Alexander, a leading authority of New York, are worth giving. He writes:—

"The early spring is one of the most important seasons of the year to the honey producer, for if he neglects his bees at this time it is almost impossible for him to obtain any surplus from his early harvest. . . . The most important

part of spring management is that of stimulative feeding, and is the magic word that unlocks the door to a successful summer. . . . There is nothing like feeding a little warm syrup daily. . . . Two cents worth per day will be enough to carry the colony through the whole spring; this will many times be the means of giving you a large increase of colonies long before your harvest for surplus honey commences." Though American conditions do not always apply to Rhodesia, this one of stimulative feeding for spring does in a large measure. No real honey-flow can be looked for until the end of September, though the warm weather will cause much activity and almost daily flights amongst the bees. This "spring" or "stimulative feeding" is not required so much to feed the colony as to lead the queen to believe that the real flow is on or coming on, and so to induce her to start regular laying.

As nearly as possible give the syrup so as to resemble a steady honey-flow; this will be the first sign that the queen will get of an impending new season, and she will start her regular laying as soon as she sees that conditions are likely to last. This in the usual sequence means a hive brimful of young worker bees all ready to take full advantage of the first show of the honey-flow and to store up their surplus in the top crates. Those not so cared for will be weak both in numbers and in producing power. Look to it, therefore, that all colonies are in proper and seasonable condition; keep them at it, and if the result is poor, destroy the queen and re-stock. There is as much difference in the amount of honey that different colonies will produce as there is in the amount of butter that different cows will make, so don't waste time on any poor stock. To quote Alexander again:—"To secure the maximum results from bees it is necessary to have the colony reach its peak of strength in number of bees just at the beginning of bloom of the first important surplus honey plants."

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Farm Homesteads.

The interesting article in the July issue of the Journal is accompanied by a plan of a three-roomed house.

While being excellent in the main design, there are yet certain suggestions in the arrangement that call for criticism. Foremost is the decision to face the house to the north, in order that the front verandah may be shady in the summer. Living as we do within a few degrees of the Tropic of Capricorn (the line of the sun's most southern declination), the summer sun looks at us from the south for comparatively few days, and then at a very high angle. In mid-summer, during the rains, when the sun is at its southern limit, Rhodesia is comparatively cool. During the bulk of the hot weather the sun plays on the north of the house, more especially during our most trying periods before and after the rains.

If it may be suggested by one who has built a few houses in this country, and not only designed but lived in them, the best aspect for a house is 20 to 30 degrees east of south. The object in turning slightly to the east is to avoid the late afternoon summer sun, which would enfilade the front verandah of a house facing due south. The morning sun does not matter.

If any settler is in doubt as to the relative virtues of the north and south aspects it is advised that he, before building, ask the opinion of someone who has occupied for a year a

house facing north. It will be found that the occupants had, on account of the sun, to spend most of their leisure in the shade at the back of the house (south).

It will be noticed on the plan that the design was drawn, checked and approved by various gentlemen. One thing is certain—the ladies were not consulted. Had they been, the house would be so arranged that all traffic and slops to and from the bedrooms would not have to pass through the living room. Also the pantry and bath-room would have changed places and enabled the occupant of the "best bedroom" to step directly into the bath-room without risking embarrassing encounters in the living room and back porch.

It may be said that the bath-room was put to the outside in order to keep the pantry cool; but a 12 ft. x 5 ft. pantry would really be no more than a store-room, with no accommodation for safes and coolers, which, as usual, would be put in some more suitable place.

This is written in no carping strain, but with the object of preventing settlers from embodying in their new homes ideas that would prove to be of everlasting discomfort and inconvenience.

I am, etc.,

"SOU'-SOU'-EAST."

COMMENT BY THE ASSISTANT IRRIGATION ENGINEER.

Your correspondent "Sou'-Sou'-East" touches a contentious matter when he discusses the question of north versus south aspects for dwelling houses. It is a point upon which opinion, both among architects and those who have had personal experience of the matter, is very much divided. For Salisbury latitude the sun is actually in the south during the period from approximately 12th November to 31st January, and is very nearly overhead from October to March. Hence, whatever advantage is to be gained during this period is in favour of the house with northern aspect.

A more important point, however, and one that is not raised by your correspondent, is the position during the winter months. The sun is then in the north, and a south

verandah would be useless. Moreover, the prevailing winds during the cold months are from approximately slightly to the east of south-east, namely, very nearly the direction proposed by your correspondent.

I appreciate the suggestion made that the bath-room and pantry should be interchanged, so that the former should be directly accessible from the first bedroom. This, however, has the disadvantage of involving two doors to the bath-room—never a pleasant feature when native servants are about.

In conclusion, I should like to emphasise the remarks made in the August issue: that it has been attempted in these articles merely to describe a general design of house, of the cheapest possible construction, and not to cater for the diversities of individual taste, beyond making it capable of certain modifications and alterations.

R. H. Roberts.

Government Farm, Gwebi.

SEEDS FOR SALE.

Salisbury White Maize	20/- per 100 lbs.
Kherson Oats	20/- ,, ,,
Kinvarra Oats	25/- ,, ,,
Ground Nuts (Spanish Bunch, unshelled)	17/6 per bag
Dolichos Beans	27/6 per 100 lbs.
White Stingless Velvet Beans	20/- ,, ,,
Linseed	6d. per lb.
Boer Manna	4d. ,,
Red Manna	4d. ,,
Sudan Grass	6d. ,,
Majorda Seed	1/- ,,
Sunflower Seed (Large Black)	15/- per 100 lbs.
Sweet Potato Slips	5/- per bag
Napier Fodder Roots	5/- ,,
Kikuyu	5/- ,,

Prices are f.o.r. Gwebi. Before sending cheques, intending purchasers are advised to ascertain that the seeds required are still available. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Salisbury.

Southern Rhodesia Veterinary Report.

June, 1927.

AFRICAN COAST FEVER.

BULAWAYO DISTRICT.—The position in the infected areas shows further improvement, and the only mortality recorded was in the Umzingwane district, as follows:—Essexvale Estate, 9; The Range, 1; Adams, 1.

A suspicious case occurred on the farm Deneys, Gwanda district, diagnosed by smear examination, the animal being a calf.

Nothing to report from other districts.

QUARTER-EVIL.

Cases of this disease have been reported from most districts.

TRYPANOSOMIASIS.

Six cases in Melsetter and one in Hartley district.

HORSE-SICKNESS.

The following mortality occurred:—Lomagundi, 1; Marandellas, 2; Shamva, 1; Macheke, 1; Bulawayo, 1.

TUBERCULOSIS.

Four bulls and 20 cows were tested with tuberculin on importation, with negative results.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 8; cows, 63; heifers, 14; calves, 2; horses, 31; mules, 5; donkeys, 39; sheep, 1,180; goats, 429.

EXPORTATIONS (CATTLE).

To Union of South Africa:—For consumption in Union, 1,249; for overseas export, 6,280. To Belgian Congo:—For slaughter purposes, 1,484. To Portuguese East Africa:—For slaughter purposes, 100.

EXPORTATIONS (MISCELLANEOUS).

To Northern Rhodesia:—Pig, 1. Belgian Congo:—Pigs, 182. Union of South Africa:—Pigs, 30.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

JULY, 1927.

Pressure.—During the month the barometric pressure was generally high, varying from .143 in. above normal at Melsetter to .057 in. above normal at Mazunga. Three highs visited the territory during the month, two—on the 18th and 30th—bringing light showers.

Temperature.—The temperatures during the month were generally low, the mean day temperatures varying from 6.1° F. below normal at Sipolilo to 5.6° F. above normal at Umtali. The mean night temperatures varied from 3.1° F. above normal at Umtali to 3.2° F. below normal at Riverdene North. The mean monthly temperatures varied from 2.3° F. above normal at Melsetter to 5.4° F. below normal at Juliasdale.

Frosts were severe during the month, being more severe and frequent in Matabeleland than in Mashonaland. Gwelo recorded frost 27 times, the lowest reading being 10° F. and the average being 26.7° F. Frost was recorded 13 times at Salisbury, with a monthly average of 33.2° F. Many other stations recorded long periods of frost.

Local Weather Notes.—The following local weather notes have been submitted:—

Zone A.—

HOLLY'S HOPE.

The conditions in regard to stock farming are, if anything, worse than ever before, mainly due to over-stocking. This in a good many cases in the district has not been done voluntarily, but owing to the quarantine regulations which have been in force for over a year now, which prevented many cattle being sold that would have

been under different conditions. Grazing in Shashani Reserve and adjoining farms is practically non-existent: cattle are living on what bush there is and the dead leaves that have fallen. Deaths due to poverty are common every day; 50 a week in this one area is becoming a common occurrence, and they are not all old cattle. Water in most of the large rivers of any account is fairly plentiful under the sand. In some favoured spots there are fairly large stretches of open water, but the general rule is to dig for it. There have been some very cold, overcast, "makaza" days during the month; quite a long spell of it during the last week, when some rain fell as well. Nights generally cold and days mild; some warm, but not hot. Light east winds have been the rule, except on the "makaza" days, when it was strong and cold.

Zone B.—

MAZUNGA.

The weather was exceptionally overcast, no cloudless day being recorded for three weeks. Winds mainly from south-east. Rivers dry. Rainfall, .09 on four days.

Zone C.—

GATOOMA.

The month has been generally cold and windy, as is to be expected at this season, 12th July being particularly cold and overcast, the maximum temperature reaching only 64°. Very light rain was recorded on the 31st July, with heavy showers, with hail being reported in the district.

HARTLEY.

Winds variable, gusty and blowy. Rain too little to do any good, except lay dust.

Zone D.—

JULIASDALE, INYANGA DISTRICT.

The month opened fine, with bright, warm, sunny days and cold, clear nights. There was a hard frost on the night of the 7th. The ground thermometer registered 11.3° F. of frost. Winds alternated between south, south-east and north. On the 12th the weather broke to overcast skies, mists and a drizzling rain driving in from the south-east.

The weather improved later. On the 19th the weather again became bad, mist and drizzle, with occasional showers, prevailing. This weather continued, with the exception of three days, till the end of the month. Rainfall, 1.69 on 11 days.

SALISBURY.

Weather was generally fine for the first half of the month, becoming more overcast towards the latter half. During this period dust storms became more prevalent. A sharp shower was recorded on the night of the 21st and drizzle on the 22nd and 30th, resulting from East Coast "highs." The pressure was generally above normal, and the high pressure which appeared on the 12th was the greatest on record for this station.

Zone E.—

ZAKA, BIKITA DISTRICT.

The weather conditions for this month have been bright sunshine until the 11th, 12th and 13th, when it was misty and cold, with slight showers of rain—.08; fine in between. From 23rd to 29th warm and cloudy, with slight shower—.03; then turned cold, and had heavy shower of rain—.28; 30th and 31st, cloudy and cold, with slight shower—.05 to .14. Rainfall for July, .58 ins.

FORT VICTORIA.

The first ten days of month were fine, but for the remainder the sky was almost continually overcast. Slight frost on 14th and 15th instant; winds cold and variable. Rain and drizzle registered .50, which fell on four days.

RAINFALL.

Zone A.—

Bubi—	
Shangani Estate	.06
Bulalima-Mangwe—	
Centenary	.05
Bulawayo—	
Observatory	.03
Gwelo—	
Gwelo Gaol	.09
Somerset Estate	.04

Insiza—	
Thornville	.15
Umzingwane—	
Springs	.21
Wankie—	
Ngamo Railway	.04
Zone B.—	
Belingwe—	
Bickwell	.36
Bulalima-Mangwe—	
Bruwapeg	.05
Garth	.07
Retreat	.01
Semokwe Reserve	.10
Chibi—	
Nuanetsi Homestead	.09
Gwanda—	
Gwanda Gaol	.11
Mazunga	.09
Tuli	.03
Insiza—	
Albany	.23
Fort Rixon	.12
Inyezi	.32
Wanezi Mission	.29
Matobo—	
Fort Usher	.04
Holly's Hope	.18
Matopo Mission	.35
Mtshabezi Mission	.09
Rhodes Matopo Park	.07
Umzingwane—	
Essexvale	.11
Zone C.—	
Charter—	
Enkeldoorn	.31
Chilimanzi—	
Beacon Hill	.09
Orton's Drift	.15

Gwelo—	
Cross Roads	.06
Indiva	.30
Hartley—	
Cromdale	.19
Elvington	.07
Gowerlands	.03
Handley Cross	.07
Hartley Gaol	.02
Pulham	.02
Lomagundi—	
Argyle	.09
Between Rivers	.18
Devonia	.19
Gambuli	.14
Msina	.18
Maningwa	.07
Mica Field	.49
Mpandegutu	.05
Raffingora	.22
Richmond	.25
Romsey	.15
Sinoia	.09
Umvukwe Ranch	.14
Woodleigh	.08
Marandellas—	
Rocky Spruit	.05
Salisbury—	
Bromley	.30
Cleveland Dam	.04
Salisbury Agric. Dept.	.01
Sebastopol	.06

Zone D.—

Inyanga—	
Juliasdale	1.69
Rhodes Estate	1.39
Makoni—	
Eagle's Nest	1.13
Wensleydale	.34

Marandellas—	
Fault Farm	.80
Mazoe—	
Argyle Park	.04
Bellevue	.07
Citrus Estate	.16
Craigengower	.03
Dandejena	.06
Donje	.10
Glen Divis	.05
Kingston	.10
Mgutu	.07
Omeath	.22
Pearson Settlement	.06
Sunnyside	.15
Mrewa—	
Mrewa	.10
Nyaderi Mission	.21
Mtoko—	
Makaha	.05
Mtoko	.05
Salisbury—	
Arcturus	.07
Chindamora Reserve	.54
Kilmuir	.08
Pendennis	.19
Vainona	.19

Zone E.—

Belingwe—	
Doro	.25
Shabani	.18
Bikita—	
Angus Ranch	.58
Bikita	1.61
Charter—	
Buhera	.21
Chibi—	
Chibi	.46
Lundi	3.19

Chilimanzi—	
Allanberry	.30
Driefontein	1.00
Felixburg	.30
Induna Farm	.24
Mtao Forest	.76
Makowries	.38
Gutu—	
Chindito	.40
Eastdale Estates	.34
Gutu	.73
Glenary	.54
Gwelo—	
Glencraig	.36
Pentridge Farm	.43
Sheep Run Farm	.14
Inyanga—	
St. Trias' Hill	.65
Insiza—	
Roodeheuvel	.12
Makoni—	
Craigendoran	.33
Gorubi Springs	1.64
Makoni Kop	.48
Mona	.70
Monte Cassino	.59
Ruati	.49
Tablelands	.91
Springs	.51
Whitgift	.13
Marandellas—	
Bonongwe	.17
Lushington	.36
Macheke	.24
Marandellas	.65
Wenimbi	1.01
Melsetter—	
Brackenbury	3.88
New Year's Gift	.52
Ndanga—	
Doornfontein	1.30
Zaka	1.32

Selukwe—	
Aberfoyle Ranch	.25
Hillingdon	.29
Rio	.58
Safago	.56
Umtali—	
Alicevale	.29
Argyle	.43
Embeza	1.54
Fairview	.45
Fern Valley	.43
Jerain	.16
Odzani Power Station	1.46
Park Farm	.55
Premier Estate	.29
Stapleford	1.30
Transsau Estate	.50
Umtali Gaol	.32
Victoria—	
Brucehame	.54
Cambria	.43
Cheveden	1.47
Mashaba	.28
Miltonia	.33
M'Sali	.64
Riverdene North	.55
Silver Oaks	.72
Stanmore	1.28
Victoria	.50
Zimbabwe	2.59

Zone F.—

Melsetter—	
Chikore	2.40
Chipinga	2.02
Lettie Swan	1.56
Melsetter	1.08
Mount Selinda	3.42
Vermont	2.99

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	...	...	112	..	...	884
March ...	135	1,837	...	2,375	...	...	50	34	...	4,431
April ...	106	2,574	...	1,440	...	...	28	...	...	4,148
May ...	205	3,458	...	1,299	...	...	118	...	...	5,080
June ...	1,249	6,280	...	1,484	...	...	100	...	...	9,113
July ...	2,569	1,850	...	1,348	50	...	141	...	...	5,958
August ...										
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Sept.	October.
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	10	8
Banket Junction	Banket Hotel	F. Potts	2	7
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	29	27
Bindura	Bindura Farmers' Hall	W. E. Fricker	10	8
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	7	5
Bubi	Queen's Mine	E. C. Gaudin	13	11
Chakari	Various farms	L. T. Tracey	15	20
Chatsworth	Makowries Farm	A. W. White	3	1
Daisyfield	Somabula (Sept.), Daisyfield (October)	L. E. Edwards	10	15
Darwendale—Trelawney	Various farms	B. Theck	14	12
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	10	8
Enterprise	Farmers' Hall	John Johnstone	5	3
Essexvale	Essexvale	C. Geneve	18	16
Felixburg—Gutu	Grasslands (Sept.), Blythe (October)	C. L. Burrows	10	8
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	6	4
Gadzema	Gadzema	G. M. Leahy	11	9
Gatooma	Speck's Hotel	C. M. Davenport	17	15
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	10	8
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	5	3
Greystone	Quarrie Farm	P. J. van der Walt	10	...
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	8	13
Inyazura	Inyazura	Major Tulloch	...	7
Lalapansi	Lalapansi	Edmund Chapman	10	8
Lomagundi	Sinoia	F. W. Robertson	...	14
Lomagundi West	Various farms	E. Morton	11	9
Macheke	Macheke	M. J. Palmer	10	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	4	2
Makwiro	Makwiro	F. H. Howard	16	21
Makoni	Rusape	—. Munch	10	8

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	2	7
Marandellas, Southern	Various farms	D. J. Gale	7	5
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	9	14
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A. Carnegie	8	13
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	17	15
Mazoe (Concession)	Concession Hotel	A. W. Laurie	9	14
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	14	12
Melsetter	Court House, Melsetter	Dr. Rose	8	13
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	14	12
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	24	29
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	2	7
Nyamandhlovu	Nyamandhlovu	R. D. McLean	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	3	1
Poorte Valley	Various places	D. Wilson	17	15
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	17	15
Salisbury South	Various farms	P. Linton	28	26
Selukwe	The Hotel, Selukwe	W. T. Simpson	2	7
Shamva	Shamva Hotel	E. Butler	15	20
Two Rivers Farming Association	Various farms	W. L. Parsons	10	8
Umboe (Branch of Lomagundi F.A.)	Various farms—Dingley Dell (Sept.)	A. J. Hawkes	10	...
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	10	8
Umtali	Drill Hall, Umtali	A. Howat	1	6
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	9	14
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	14	12
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

September.

BEE-KEEPING.

In sheltered localities many trees in the bush will now be in bloom. Should there be indications of swarming, put on a crate of sections or shallow frames, correctly fitted with super-foundation. Where a swarm has been secured, place it in a modern hive, and from an established stock remove a frame of comb containing unsealed brood and honey, shake off the adhering bees on to their own alighting board, then insert this comb into the centre of the newly hived swarm. This plan compels the bees to start work at once. As a means of preventing the escape of the queen, a narrow strip of excluder zinc may be fastened at the entrance. This should be removed after about two weeks.

CITRUS FRUITS.

If the trees were irrigated early in August, the next application of water should be given about the first or second week of this month. After irrigation, cultivation should follow. Constant attention should be given to young trees, and a watch kept for any adventitious shoots or suckers, which should be cut away at once. This should be attended to right through the growing season.

CROPS.

From now onwards there should be no further danger of frost, and crops that are susceptible to low temperatures may be planted where moisture is available. Such are potatoes and Jerusalem artichokes, onions in beds for the main summer crop and early maize and pumpkins in vlei lands.

Ploughing, cross-ploughing and the treating of land with farmyard manure will be continued and the fields will be got into the best possible tilth preparatory to sowing. Where this has been done, and check-row planting of maize is practised, the holes can be prepared at the requisite distance apart.

Early varieties of winter cereals will be ripening and the harvesting of these will commence.

ENTOMOLOGICAL.

Cotton.—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

Tobacco.—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and 21 lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30 yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would

have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip may be made now.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. All gum seeds should be planted now if it is intended to grow the transplants in tins. If they are to be grown in beds only, do not plant gum seeds until next month. The seed beds may with advantage be prepared now and watered to make the weed seeds germinate, so that they may be destroyed before planting next month.

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more. Green food in abundance must always be given, otherwise the health of the birds suffers and the egg output is considerably reduced.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat

should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder, for to keep poor ones only means much waste of food and labour. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. Bulletin No. 517, which can be obtained from the Department of Agriculture, gives clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets, i.e., those hatched in April, should show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or onion tops or eschalots, and thick separated milk. These are absolutely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

TOBACCO.

Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of

years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
22.7.27.	Government Notice No. 404 removes the quarantine from all areas previously infected in the Melsetter district.
22.7.27.	Government Notice No. 405 removes the farms Fangudu and Cronley from the areas of infection in the Umtali district.
22.7.27.	Government Notice No. 406 amends the area of infection and guard area slightly in the Bulawayo district.
22.7.27.	Government Notice No. 407 adds the farm Deneys in the Gwanda district to the areas of infection and slightly reduces the Umzingwane guard area.
	POUND.
19.8.27.	A Pound has been established at Oakley Park, Tsungwesi Siding, Umtali district.

Departmental Bulletins.

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AGRICULTURE AND CROPS.

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No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 388. Kudzu Vine, by H. G. Mundy, F.L.S.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
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Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

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No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

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Cold Weather: Treatment of Fowls in, by A. Little, Poultry Expert.
Tuberculosis, by A. Little, Poultry Expert.
Diseases of the Liver, by A. Little, Poultry Expert.
Prevention of Disease among Poultry, by A. Little, Poultry Expert.
Vices: Causes, Prevention and Cure, by A. Little, Poultry Expert.
Chicken-pox (Warts), by A. Little, Poultry Expert.
Autopsies, by A. Little, Poultry Expert.
Autopsies (continued), by A. Little, Poultry Expert.
Preparing Birds for Show, by A. Little, Poultry Expert.
Coccidiosis, or Entero Hepatitis, by A. Little, Poultry Expert.
The Fowl Tick (Argas persicus), by A. Little, Poultry Expert.
Worms (Autopsies—continued), by A. Little, Poultry Expert.
Artificial Incubation, Brooding and Rearing of Chickens, by H. G. Wheeldon, Assistant Poultry Expert.
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The Normal and Pullet Moult, by H. G. Wheeldon, Assistant Poultry Expert.
Culling: A Seasonal Operation, by A. Little, Poultry Expert.
Despatching Birds to a Laying Test, by A. Little, Poultry Expert.
Choosing a Male Bird, by A. Little, Poultry Expert.
The Breeding Stock, by A. Little, Poultry Expert.
Diseases of the Digestive System, by A. Little, Poultry Expert.

METEOROLOGICAL.

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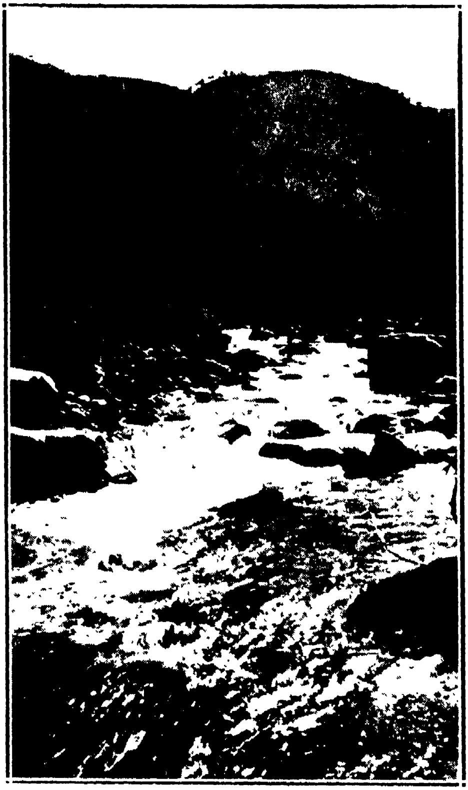

Tanganda River above the hatching boxes.

Trout in Rhodesia.—Hatching boxes in position on Tanganda River, South Melsetter. (See editorial note.)

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.

Trout in South Melsetter.—The photographs reproduced on the opposite page have kindly been supplied to us by Mr. Arthur Ward, of New Year's Gift, Chipinga. From notes which Mr. Ward also sends us it appears that, through the efforts of Mr. P. C. Braybrooke, of the Native Department, Chipinga, a branch of the Rhodesia Angling Society was formed and funds raised to make a start on importing and hatching trout in the district. Various trout hatcheries in the Union were approached, but they seemed very reluctant to part with any ova. However, the Perie hatchery eventually agreed to sell 10,000 ova of rainbow trout, and these were sent up last July.

It was decided to hatch out the trout in the Tanganda River on Messrs. Ward and Phillips' farm New Year's Gift, 110 miles from the nearest railway station—Umtali. The ova were sent by post to Bulawayo to Mr. J. Moss, who picked out all the dead ova and packed the balance in a specially made box containing a zinc tray of ice. This box was sent forward by rail to Umtali, together with a plentiful supply of ice, and instructions given to the railway guards to keep the ice in the tray replenished. A motor truck awaited the arrival of the ova in Umtali and left immediately, travelling through the night. In the event of breakdowns, a native and a bicycle were carried on the motor truck. About 70 miles from Umtali the back axle broke and the native rode on for assistance. However, before the native returned another car came along and took on the box of ova, which arrived at New Year's Gift about 8 p.m. the following evening. The ova were placed in the hatching boxes in the Tanganda River by the light of an electric torch. Nine thousand ova were placed in three floating hatching boxes, and one thousand ova were taken on to the source of the Buzi River near Chipinga and placed in a petrol tin hatching box.

Mr. Ward states that many of the ova were dead on arrival and some were on the point of hatching. The ova were kept in the boxes for about two weeks; it took about two hours' work each day to remove dead ova and alevins. It is estimated, however, that fully four thousand healthy fry were liberated in the Tanganda River, and Mr. Ward expresses the hope that in about eighteen months' time a new sport will be established in Rhodesia. We cordially endorse this hope, for we can conceive of nothing more calculated to popularise this beautiful portion of the Colony than the attraction of trout fishing.

Weather Forecasts.—The issue of a daily weather report and short period forecast will be resumed on the 1st November. These forecasts will be issued at noon daily throughout the season and cover a period of 48 hours. Last season they were telegraphed to the following centres:—

The branch secretary and the official hatcher smiling in anticipation of tight lines.

Pulling in the boxes for examination. Trout in Rhodesia. (See editorial note.)

Arcturus, Belingwe, Bindura, Bromley, Bulawayo, Banket Junction, Concession, Darwendale, Glendale, Heany Junction, Hartley, Hunter's Road, Inoro, Lydiate, Makwiro, Gatooma, Gwelo, Nyabira, Glenara, Ballineety, Marandellas, Mazoe, Norton, Penhalonga, Premier Estate, Rusape, Shamva, Shagari, Shangani, Sinoia, Victoria and Wellesley. Farmers in these localities can obtain a copy of the forecast on application to the postmaster or postal agent. Farmers in other localities who may require these forecasts should inform the Hydrographic Engineer, Department of Agriculture, and arrangements will be made to telegraph the information to the nearest post office.

Plant Protection.—We understand from the Journal of the Ministry of Agriculture that the second International Conference for Plant Protection has been fixed to take place early in November, 1928, so as to coincide with the work of the ninth general assembly of the International Institute of Agriculture. The first conference was held at the Institute's offices in Rome from 24th February to 4th March, 1914, when a draft convention was drawn up for submission to the adhering countries, providing for common action against the introduction and spread of plant disease. Owing to the outbreak of war a few months later, the matter remained in abeyance, and, when the subject was re-considered, it was felt that the time which had elapsed and the generally altered circumstances would necessitate amendment of the original draft convention. The subject was further examined by an International Commission of Experts in Phytopathology, which met a few days before the opening of the general assembly in April of last year, and a revised draft convention was agreed upon and approved by the general assembly. This revised scheme will be considered at next year's International Conference.

Farm Tractors.—We publish elsewhere in this issue of the Journal a valuable article on farm tractors to which we specially direct the attention of readers. The author, Mr.

A. W. V. Crawley, of Dawn Ranche, Macheke, has a practical knowledge of his subject and supplies information which will be of the greatest value to those who are using tractors for farming purposes. Mr. Crawley's remarks deal mainly with types of implements suited for haulage by tractors, although he has something to say about the running of the tractor itself. It is within our knowledge that tractors have been condemned by some farmers when the prime factor was the unsuitable type of implement attached to it. In a letter which Mr. Crawley writes to us he mentions the fact that many years ago he did some experimental farming with tractors, and at that time it was always the tractors that gave trouble—so much so that it quite obscured the fact that proper implements and soil knowledge were also necessary. Since then, tractors have been much improved, and a more important factor now is the adoption of the right type of implement. Mr. Crawley deals with the subject in a comprehensive manner, and we feel sure that farmers will appreciate his action in placing his store of experience at their disposal.

Everyone associated with farming in this Colony, and many others, realise that the future of the agricultural industry depends to a very large extent upon the adoption of labour-saving devices. The economic use of tractors for ploughing and other agricultural operations is a first necessity, and readers will note with interest the reference which Mr. Crawley makes to suction gas as fuel. We printed in the last issue of the Journal an article on suction gas tractor trials in France, from which it will be seen that charcoal is being tried and that a particularly severe test is being carried out by the French Ministry of War this autumn of motor vehicles running on suction gas. Suction gas lorries and tractors are to run from Tunis across North Africa to Casablanca with the aid of charcoal produced by portable carbonisers along the route, and we hope to be able to obtain information as to the results. The possibility of using charcoal or maize spirit, to which Mr. Crawley also refers, as motive power for tractors in Rhodesia opens up a wide field of speculation as to the developments which would follow.

Champion female on Salisbury Show, bred and exhibited by Mr. Duncan Black, Selby, near Salisbury.

Bridgebank Condor, champion bull at Bulawayo and Salisbury Shows. Owners: Messrs. Dalton & Taylor, Gatooma.

Winning pen of slaughter animals (full mouth), Salisbury Show. Fattened and exhibited by Mr. A. L. Millar, Estes Park, Salisbury, and bred by Mr. P. Gresson.

Champion ox on Salisbury Show, exhibited by Mr. C. C. Macarthur, Komani, Salisbury.

Imperial Agricultural Research Conference.—An Imperial research conference will be held in London this month and will be attended by some 70 delegates of high administrative and scientific standing from the overseas parts of the Empire, together with delegates and representatives of similar standing from Great Britain and Northern Ireland. Southern Rhodesia will be represented by Mr. G. N. Blackshaw, O.B.E., B.Sc., F.I.C., late Chief Chemist of the Department of Agriculture.

The conference will discuss subjects of great importance, for agricultural research has close bearing upon the conditions of life. For instance, it is probable, but for the results achieved by scientific workers, that our foodstuffs would be poorer in quality and would cost us more. In a new country such as Rhodesia, agricultural research is of the utmost importance, and this fact has always been recognised by the officers responsible for the administration of the agricultural and veterinary services. Much has been achieved, but there is a great deal still to be done. We have much to learn yet in regard to the control of animal diseases, the improvement of our main crops and the elimination of tsetse fly. These items are sufficient in themselves to occupy our research workers for many years and to justify the expense which such work entails. Quick results cannot be expected; it is only by patient skill and the infinite ingenuity of research workers that nature will yield up her secrets. We are very pleased that such a conference is to be held, and are sure that the exchange of knowledge and discussions which will ensue will have an important bearing on future work.

The chief subjects to be discussed at the conference will be the extension of the system of Imperial bureaux from entomology and mycology to other departments of agricultural science; the interchange of information among agricultural research workers; the recruitment, training and interchange of workers, and the development of the chain of agricultural research stations throughout the Empire. The main meetings of the conference will be held in London, Cambridge and Edinburgh.

The Empire Marketing Board has made a grant to cover the expenses of the conference, for which the arrangements are being made by the Ministry of Agriculture and a representative organising committee.

Tobacco.—Tobacco growers are busy sowing seed beds and making preparations for the planting of next season's crop. From what can be gathered, there will be a further increase in the acreage, which last season approximated 32,000 acres. The splendid crops reaped in Mashonaland and the satisfactory prices so far obtained have popularised tobacco to such an extent that there is a very real danger that on many farms it will be grown almost to the entire exclusion of other crops. Reliance on one crop is an extremely risky proceeding in any country, but especially is this so in Rhodesia, where the seasons are so variable and where there is always a danger of pests and disease taking a heavy toll of the plants. The Department of Agriculture has always set its face against dependence on one crop; the wisdom of this advice has been proved time and again and is fully realised by the older farmer. The warning we wish to utter is to the newer settler, especially the man from overseas, who has little or no knowledge of our conditions. The temptation to "get rich quick" is great, and quite a number of new settlers last season made handsome profits with apparently little effort. Such excellent planting weather as we had in December last does not always occur, nor does it always happen that timely rains arrive to save the crop as they did last year. Without going into detail, suffice it to say that our seasons are capricious, and that to rely on one crop alone is to court disaster.

Another real danger is the tendency to plant a larger acreage than can be handled properly. There was a large area under tobacco last season that was not reaped owing to the lack of barn accommodation or insufficient labour. These areas had to be ploughed, planted, fertilised and kept cleaned, and the loss was often considerable. It is surely better to plant an acreage that can be properly attended to and will yield a good quality leaf. We have in season and out of season advised growers to concentrate on quality rather than quantity, and the need to-day appears to be more urgent than ever. Fears have been freely expressed that the English market will not be able to absorb all the tobacco that will be produced in Southern Rhodesia next season; whether this is so or not it is difficult to say at the present time, but there is no question that it will be difficult to dispose of leaf of inferior quality at a paying price. The aim of the tobacco

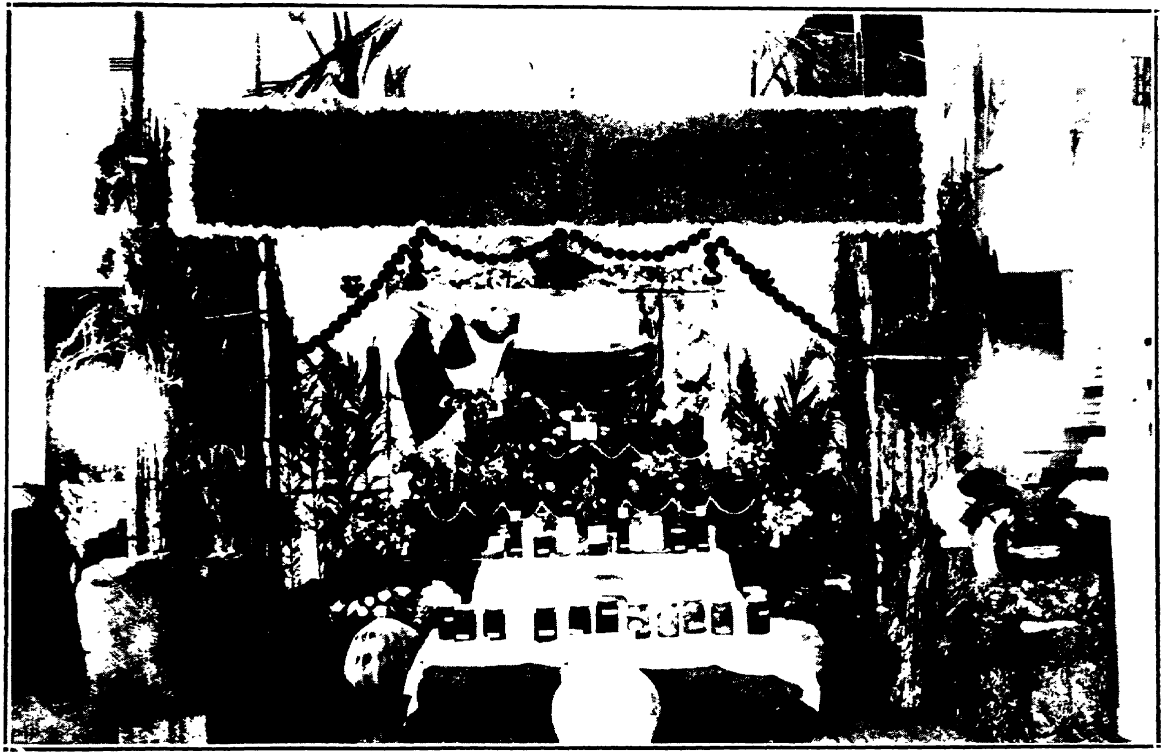


Exhibit of Eastern Fort Victoria Farmers' Association at the Salisbury Show. Awarded first prize.

grower should clearly be to produce tobacco of suitable quality for the British market, and this can only be achieved by close attention to the many details which the crop requires. It may be necessary to exploit other markets until such time as Great Britain can absorb our whole production, and this may be engaging the attention of those responsible for selling the crop. It is interesting to recall that in 1913 Dr. Eric Nobbs, who was then Director of Agriculture, visited Australia for the purpose of investigating the possibility of selling Rhodesian tobacco in the Commonwealth, and wrote a valuable report thereon. We notice that Australia is still importing the great bulk of her supplies, and that during the period from 1920 to 1925, 21,060,779 lbs. of tobacco were brought into the country. Most of the tobacco was unmanufactured, and the value of the importation of this particular kind of tobacco in 1924-25 was £2,005,939. The duty on unstemmed leaf is 2s. per lb., and so far as we know there is no preferential advantage to South Africa.

We regret that, owing to pressure of work in the office of the Irrigation Engineer, we are unable to reproduce in this issue of the Journal drawings of a 12 ft. x 12 ft. flue-curing tobacco barn, showing an improved system of roof ventilation. We believe, however, that the plan will be ready for reproduction in our November number, after which it will be available in bulletin form.

District Exhibits.—We reproduce on the opposite page a photograph of the exhibit staged by the Eastern Victoria Farmers' Association. This exhibit was awarded first place in the district displays and was the subject of much admiring comment by many visitors to the show, including the Right Hon. L. M. S. Amery. We congratulate the association concerned upon the general excellence of the display, which was brought to Salisbury from many miles distant and under many difficulties. These district exhibits have become an important feature of our shows during the past few years, and we hope they will be maintained. Each serves to demonstrate the productivity of the district it represents, and is in effect the shop window of the farmers of the locality. One is able to see at a glance what a particular district excels

in as a result of climatic and soil conditions. Tobacco is the centre of attraction at one exhibit, maize and grain crops at another, while citrus fruits and dairy products predominate at another stall.

The effective staging of collections of produce calls for ability of a specific order. Displays sometimes fail in effectiveness owing to the specimens of a certain product being too limited in number, while in other instances such specimens may be scattered throughout the stall instead of being massed for effect. The general appearance of the exhibit as a whole is of prime importance, and a glance at the illustration will show that the Eastern Victoria Farmers' Association are fully alive to this fact.

We do not intend to enter into any detailed criticism of these district exhibits, for the comments of the judges have been published in the excellent reports which appeared in the daily Press. It is, however, of importance that products should be correctly labelled, and those who erred in this respect will no doubt see to it that there will be no cause for complaint in future. The bags containing seed should be white, while of course no product showing any sign of disease should be staged. The friendly rivalry which this competition evokes must make for the advancement of the agricultural industry, and those responsible for the collection and staging of the exhibits deserve every credit for a work which entails thorough organisation and much application.

The display of agricultural implements and farming machinery at our shows is each year assuming greater proportions, and we wonder whether the time has not arrived when awards should be made for exhibits of special merit. The same remark applies in regard to the exhibition stalls of local merchants, which are a very attractive feature at the larger shows. Perhaps the committees of the various societies will give the suggestion their consideration.

Tractor Notes.

By A. W. V. Crawley, M.E., F.G.S.

Several types of tractors are now available in Rhodesia to suit varying conditions. The small and medium light-weight economical tractor is probably the most generally useful for our conditions. With favourable conditions a small farm could be worked entirely by tractor; it will, however, generally be found that using a tractor to supplement the work of oxen is the best paying proposition. The success of smaller settlement schemes would be best assured by the use of the small or medium size tractor, with suitable tractor implements, but the implements would have to be properly selected and suitable for the soil conditions.

The main points in choosing a tractor are adaptability to your conditions, economy of operation and upkeep, ease of handling, variety of implements available and the actual service behind both tractor and implements. Special requirements for Rhodesia are complete enclosure of all working parts, three speeds forward and one reverse, oil tightness of all joints, efficient strainers on oil fillers, good crank case ventilation and, most important of all, efficient air washers or filters.

Ploughing.—This at present forms the largest percentage of the work done by tractors in Rhodesia. Tractor ploughing when properly done is much better than can be done with oxen. Maize gives an increase of from a half to two bags per acre when the ground is ploughed by tractor instead of by oxen. In Kenya it is reported that the increase has sometimes exceeded four bags per acre. The reason is that tractor ploughing is more uniform in depth, no blank or hard patches are left and the soil itself is put into much better condition for the liberation of plant food. In old lands fairly free from weeds it is quite possible to make an almost

perfect seed bed with the tractor plough alone, providing the proper type of plough is used and the ground is in proper ploughable condition. I am often asked which is the best type of plough—mouldboard or disc—for use with a tractor. To do the best work and to get the best results from a tractor both ploughs are necessary on a farm. If it is only possible to afford one plough, the disc is the one that will do the most work under varying soil conditions. Given suitable conditions, a mouldboard will generally give better results, as it leaves the ground in a better condition than a disc does. A disc plough should be used when the ground is very hard and dry; it was primarily invented for such conditions. A disc plough works better in very gravelly soils—hard pan and sticky soils that do not scour well with a mouldboard. In moist soils, light sandy soils, and generally in very weedy lands, newly cleared lands, grass lands and vlei soils, the disc will not do as good work as will the mouldboard. Both types for tractors are known as self-lift, and the mechanism for this is actuated by a trip rope or rod. The rod is much preferable, as the rope often gives trouble by breaking and entangling, thus wasting time. When purchasing, the agents can in most cases arrange a trip rod to replace the rope on a rope-operated lift. All rear attached tractor ploughs and other implements are provided with a wooden brake pin to prevent damage both to tractor and implement when a root, rock or other hard substance is struck. Never substitute a bolt or piece of iron for this brake pin, or some day a bad smash will surely occur. These brake pins are made of hard wood, and different varieties are not always effective. By experiment I have found that pins made of *Dodonea viscosa* give the best results and are the cheapest and easiest to make. *Dodonea viscosa* is extremely hardy, and easy to grow almost anywhere in Rhodesia, so every tractor owner can grow his own brake pins. It should be noted particularly that tractor ploughs must be used with tractors. Other kinds of ploughs can sometimes be used, but never do good work or give satisfaction.

Mouldboard Ploughs (Rear Attached Type).—The best type for Rhodesia is the adjustable tractor mouldboard plough that can be adjusted so that each bottom cuts 10, 12 or 14 ins. When ploughing is difficult, set the bottoms

to cut narrow; when conditions are favourable, adjust to full width. A novice for the first season might only do good work with a 12-in. cut; as he became more efficient in handling the tractor, and as the soil improved—it generally does with tractor ploughing—he could use a 14-in. cut at the same operating cost as for the 12-in.

A new tractor takes some time to run in and develop its maximum power. For a while it can only operate a 12-in. cut and yet be capable of doing 14 ins. later on. There are many types of plough bottoms for various kinds of work and soil conditions. The most useful out here is the general purpose bottom. Various bottoms are sometimes to be had for the same plough, in which case the general purpose and the deep ploughing bottoms are the two most suitable for our conditions. I believe that at present only steel—generally soft centre steel—bottoms are obtainable here. I have been trying to get agents to stock chilled bottoms as being more suitable over a large range of our soils. Soft centre steel for tractor work is quite unsuitable for land containing much grit, sand, gravel or stones. Soft centre steel ploughs are the best of all for the land they are suited to, but for sand veld districts chilled iron would give much better results. Chilled iron has the advantage that it is very little affected by rust, as rust does not pit it or roughen the surface, even when left exposed for months. Soft centre steel with only short exposure will so rust and pit that its scouring qualities are affected, and this always increases the cost of operating. When not in use, always keep steel breasts and shares covered with protective substance. Grease and oil rub or wash off sometimes. I use the cheap black bitumen paint, which can be quickly and easily applied and dries quickly. This ensures absolute protection, and yet comes off as soon as the plough has travelled a few feet in the ground. Breasts and shares that have lost their smooth polish by the action of rust or scratching by gritty material increase the draught considerably, and the fuel consumption of the tractor at the same time. The using of the wrong type of plough for the soil and the wrong type of metal for breasts and shares will in extreme cases make the cost of tractor ploughing almost prohibitive. I know of a case where the owner of a tractor outfit reported to the agents that it would not plough properly. A mechanic was sent down and quite failed

to remedy matters, and the tractor was given up for ploughing purposes. Naturally the tractor was blamed until I pointed out that it was the plough that was unsuitable. With another owner and different plough the same tractor was quite satisfactory.

Shares are a very important item, and if not of the right material for the soil conditions they are also a very expensive item. There are three kinds in most general use: soft centre steel, crucible and chilled shares. In the sand veld areas chilled shares will do from three to four times the acreage that can be done with any other type. Some agents deny this and back up their assertion by not stocking chilled shares, so chilled shares are often hard to procure. In six years I was only able to procure four chilled shares, and these had to be got from the Union. As a last resort I had to import some direct. Soft centre steel shares with my soil conditions will only satisfactorily plough 50 acres, while many of them will not do this. Crucible steel shares are slightly better and also cheaper. Chilled shares can be depended on to do at least 150 acres, and they are the cheapest to buy in the first instance. Many farmers find it very difficult to re-sharpen and temper either soft centre or crucible shares, although most makers say it is easy, and they give elaborate explanations of how to do it. Chilled shares cannot be tempered, but are sharpened by grinding to a bevelled edge on the upper side of the share. If, when using soft centre shares, the surface quickly wears in grooves and hollows and the point quickly goes, leaving the soft centre exposed, change to chilled shares; failing these, use crucible steel.

Unsuitable shares are often the cause of high costs per acre. Some years ago, experimenting on difficult soil with a two-furrow plough, the soft centre shares sometimes only ploughed four acres and the shares were useless; the hard top layer of steel was partly worn away, exposing the soft centre, and the points were completely gone. The agents advised that nothing could be done except to throw the shares away and get new ones. At that time the shares cost 42s. each, so my cost for shares alone worked out at 21s. per acre. This was an extreme case, but serves to show that the question of shares is a very important one.

If it is found that there is a small centre groove along the cutting edge of a share, that share is a soft centre steel share and unsuitable for the soil conditions. To remedy, use crucible or chilled shares. Sometimes this groove is caused by improper tempering; but whatever the cause, its existence will affect the draught and cause increase in fuel consumption. Weight is not required in a mouldboard plough; it is the shape of the share and breast that causes it to be pulled into the ground. Providing the plough is of proper design, failure to penetrate properly in suitable soil can only be remedied by adjustment to the hitch, and not by extra weight. For complete turning in of green crops or grass, see that the plough is equipped with rolling coulters and jointers, which must be properly adjusted to do good work.

Side attached mouldboard ploughs are coming into use, and for some soils and conditions present considerable advantages. These are not yet obtainable in Rhodesia.

Disc Ploughs (Rear Attached).—Several makes of these are available, and nearly all of them are adjustable to make a cut of from 6 ins. to 10 ins. each furrow, to suit varying conditions. Disc ploughs are much heavier than mouldboards, and this extra weight in light soils causes the tractor to dig in or stall, thus wasting time and increasing fuel consumption. Unsuitable design, apart from weight, will also have the same effect, as will also an improper hitch. The hitch should be adjusted to keep the front of the plough well down in the ground and enough weight added to the rear to keep it at the required depth. With most tractor disc ploughs suitable wheel weights are provided for varying conditions. For deep ploughing with a disc plough, setting the discs to cut narrower gives the best results. Do not leave the scrapers off disc ploughs; they help in better pulverisation of the soil, turning in of weeds, etc. They require to be properly set for the purpose.

Side Attached Disc Ploughs—popularly known as push ploughs—have lately come into use and possess many advantages over the ordinary type. At present I think they are only procurable here for the Fordson. These ploughs are easy to operate, and the work being in front of the driver, there is no necessity for constant looking behind to see if everything is going right; this makes them more suitable for

night ploughing than the other type. These ploughs are lighter than rear-attached ploughs, and they rarely cause any digging-in troubles. Being in front of the rear driving wheels, the weight of the tractor is utilised to force the discs into the ground, and suitable springing prevents shocks and jars to the tractor. With this type of plough it is easy to plough round stumps and dodge rocks, etc.; corners can be ploughed into and the plough backed out when there is not enough room to turn round. Fences, hedges and tree rows can be ploughed up too, so that the outside furrow is thrown right against them if required. A single lever in front of the driver controls the plough, setting it to depth required or lifting it high enough to clear all obstructions when travelling. These ploughs are actually pushed from the draw bar attachment, and do not—when properly designed—strain the tractor in any way, and there is absolutely no side draught. That they are easier on the tractor is quite certain, as, when experimenting, I found that a Fordson which will only handle a two-disc rear-attached plough pushes a three-disc side-attached plough quite easily on ploughing speed and with no increase of fuel consumption.

Cultivating.—This can be done with tractors till the plants are from 12 ins. to 18 ins. high, but unless the acreage is large and time limited, it is often cheaper to cultivate with oxen. Cultivating should really be done with the cultivator in front of the tractor. Where much cultivating of growing crops is required the small type of tractor—specially built for cultivating and light work—should be used. The cultivation of growing crops rarely requires to be deep, and it is poor economy to use a heavy 20 h.p. tractor to do the work which only requires about 4 h.p. These small tractors are not yet available here, but are coming into use elsewhere. With the heavier types of tractor it pays to so work your soil before planting that the minimum of cultivation is required after the crop is up.

Mowing.—To do this economically a special tractor mower is always advisable. These are generally arranged so that the mower knife is driven from the engine direct or from a power take-off. Some are arranged to be driven from the back axle or wheels; these are to be avoided as unsuitable for Rhodesian conditions, as the knife can only be worked

when the tractor is in motion. Side attached are preferable to those working at the back of the tractor. For emergencies —if on fairly level land—ordinary mowers can be used; when so used, such mowers will not last long, as the oiling and bearing facilities are inadequate for tractor work; also the wheels slip, causing the knife to jam or clog, and they also require an extra person to control the lifting and tilting apparatus. A tractor mower should be controlled by the driver alone. Various makes of ordinary mowers were tried by me on a wet vlei of about 40 acres, which was in places very rough and full of old rice pits. Mowing it with oxen was found to be impossible, so the machines were hitched to the tractor. Only one machine would stand up to the work, and this with great difficulty mowed the vlei in six days. The next season a tractor mower was procured and the work done easily in two days. Owing to the regularity of running and closeness of cut, nearly a third more grass was obtained with the tractor mower.

Maize Planting.—No special machines are available, but one or more two-row planters can be hitched to a tractor. I generally use three single-row planters behind an 8 ft. heavy tractor cultivator and thus cultivate in front of the planters.

Harrowing, Rolling, Deep Cultivating, etc.—This can be done with most of the ordinary farm implements, but better results are possible when the special tractor implements for the purpose are used. Combined operations, such as harrowing and rolling, can be done at the same time by hitching the necessary implements to the tractor.

Belt Work.—All belt-driven machinery can be operated by tractors, but some care should be taken to see that the horse power of the machines should be somewhere near the rated horse power of the tractor, and at least not less than 50 per cent. below. It is not economical to hitch up a 5 h.p. machine to a 20 h.p. tractor for regular use, though it may be done in an emergency. A tractor gives its full horse power on the belt and 50 per cent. (more or less) of its rated power at the draw bar.

Transport.—For general transport, tractors as a rule are not very useful unless special wheels and special trucks are

used. On the farm the tractor is very useful for farm transport and short trips and can be hitched to any vehicle without alterations. Better results are obtained by removing a long disselboom and substituting a much shorter one, but this is only required if for fairly regular use. The steel wheel wagons are the best—or rather most suitable—but watch the rear wheels when backing, as they often come off. When using any ordinary farm vehicles and implements for tractor work, be sure to tighten up all nuts on the various bolts, as, owing to increased vibration due to higher speed, any loose nuts will work off and bolts drop out. Use spring washers where possible.

Tractor Troubles.—Tractors now being such reliable machines—more so than motor cars—rarely give trouble: when they do, it is usually due to bad handling by the operator. Many tractor owners have written me that their chief trouble is digging in; some even state that they have to have a span of oxen in attendance to pull the tractor out. In such cases—providing the tractor is not actually much too heavy for the type of soil and the soil conditions—any competent tractor engineer or the agents can generally remedy matters. If spuds are being used, the remedy is often found in replacing them by one of the various types of strakes or cleats. In other cases increasing the height of cleats or extending them will cure the trouble. In extreme cases different types of wheels may be required. More often than not the trouble is due to the use of implements unsuitable to the particular type of soil, or to wrong adjustment of the implements themselves. The remedy suggests itself. Perhaps I have been unlucky, but I have never yet purchased an implement in Rhodesia that has been properly adjusted when delivered to me.

Excessive Fuel Consumption.—This is often due to lack of knowledge of the proper working of the implements used and to wrong types. With ploughs it may be caused by shares and breasts being of the wrong material, or by wrong setting of the plough and bad adjustment of the hitch. The remedy is to acquire the necessary knowledge to obtain correct implements and to know their adjustment. If due to the tractor, follow the instruction book and adjust it yourself or get the agents to do so. It must always be remem-

bered that a new tractor will take some time to run in, and that till it is properly run in maximum power with minimum fuel consumption cannot be obtained. Starting from cold, a tractor will not develop its full power and will often stall till thoroughly warmed up. When carburettor adjustments are, as they should be, readily accessible, the adjustment is often altered by natives who gather round the machine during the driver's absence. A choked or dirty air washer or filter will always cause high fuel consumption.

Excessive Oil Consumption.—In a new tractor this is generally due to some defect in the oil circulation, overloading the tractor, racing the engine or to unsuitable oil. The instruction book can usually be relied on to state the correct oil, but not always. One tractor I had would not run satisfactorily on the oil recommended. I experimented and found the right oil, and the tractor gave every satisfaction. After a lengthy correspondence the makers acknowledged that a mistake had been made and the wrong oil recommended by them. If a tractor has been in use some years and then suddenly develops high oil consumption, often accompanied by increased fuel consumption, a general overhaul is indicated.

Cost of Running Tractors.—At present the majority of tractors in Rhodesia are run on paraffin. Paraffin of 125° fire test is preferable to that of 150° test and is slightly cheaper. Power paraffin is generally simply paraffin of 125° test. Petrol is only used for starting, and I find that the cheaper brands, such as Auto Motor Spirit, give good results. It is even more important to strain the paraffin than the petrol, and a funnel with a double gauze strainer is always desirable for filling.

If the tractor or implements or both are not suitable for the conditions, running costs will be high. It is most important to get the right tractor and implements if running costs are to be kept down. A neighbouring farm may be successfully running a tractor of certain make, but this is no guarantee that it will be suitable for your conditions.

The cost of fuel, using paraffin, is fairly uniform, all types of tractors averaging under varying conditions from one and a half to two gallons per acre for ploughing, whether

a two-furrow tractor or a six-furrow one is used. In the matter of total cost per acre the smaller tractors are generally more economical than the larger sizes. The total cost per acre is much more dependent on the knowledge of soils and implements and the ability to use them than on mechanical knowledge of the tractor itself. Producer or suction gas is being much experimented with, and it is only a question of time before tractors can be run by this gas much cheaper than on paraffin. Some successful demonstrations have been lately given in England, but protracted field trials have not always confirmed these. For Rhodesian conditions the extra weight of the apparatus to convert the charcoal into gas is a great drawback, but this is likely to be remedied shortly, as the newer and improved types are being made much lighter in weight.

Crude Oil.—Various types of semi-Diesel tractors have come into existence, and where crude oil is cheap they plough at a low cost. A crude oil tractor lately brought out in Germany claims that, with crude oil at £4 10s. per ton, ploughing can be done at from 4d. to 6d. per acre. So far this type of tractor is made far too heavy to be generally successful on most of our soils.

Motor and Tractor Spirit from Maize.—A very cheap fuel for both tractors and cars might be made from maize. Some experiments made in Queensland were said to produce such a fuel at about 1s. per gallon and a most excellent cheap cattle food obtained from the residues. If something like this could be done in Rhodesia it would give us a cheap tractor and motor car fuel and cattle food, benefiting the farmer and all car owners, and at the same time establish a new industry which would benefit the whole country as well.

Hay-making in Southern Rhodesia.

By C. Mainwaring, Agriculturist.

Anyone at all interested in farming cannot but be surprised at the enormous waste of indigenous summer grass that annually occurs in Southern Rhodesia. Its natural preservation in the shape of hay is surprisingly neglected, considering the vast amount of material available for this purpose, and it may be said that not more than 10 per cent. of our farmers take this easy opportunity of securing this valuable winter feed.

It is true that some of the newcomers are taking this matter more seriously, and those who do so are well rewarded. Few of the older settlers, however, appear to realise the great asset they possess in the many acres of rolling grass which is every year allowed to be wasted through veld fires, thus in many cases debarring their unfortunate animals from the only chance of providing themselves with sustenance.

The success of the dairy industry and its future development in Rhodesia depends largely upon the attention which is given to the production of hay and forage crops for winter feed. Reflection on the loss due to the decrease of the milk supply, brought about by bare veld and the absence of succulent food, reveals the necessity of making and storing hay of good quality to tide over the six dry months of the year. Experience has shown that any season may bring a long spell of drought, resulting in scarcity of pasturage, and this, particularly during the winter, is the cause of heavy losses to dairymen and stock owners.

To prepare for such times of scarcity, hay and forage crops must be harvested and stored. To make hay of good quality in Rhodesia is often a difficult matter; most of our principal natural grasses are at their best for this purpose

during the month of February, while the heavy rains are usually not over until some time in March. Thus hay-making occurs at a time when weather conditions cannot always be relied upon. This difficulty can be practically overcome by grazing the veld intended for hay until the middle of December to retard the development of the grass, so that it will be at the correct stage for cutting after the late rains are over. The ordinary veld hay grasses are not inclined to make much of an aftermath after cutting, therefore they should be allowed to stand until they are in the best condition—that is, when they are in flower.

With crops such as teff and Sudan grass there are several factors to be considered in determining the proper stage at which to cut for hay. If only one cutting is to be made, the greatest yield will be secured by allowing the crop to reach the full flowering stage. When two cuttings are to be made, the greatest yield is secured by cutting the first growth at a somewhat earlier stage and before the end of the rainy season.

The most abundant and at the same time probably the most useful native grass found growing over large areas of the Rhodesian veld is the rooi grass. This grass is a tufted perennial which covers many acres of plains and hillsides at varying altitudes, almost to the exclusion of other vegetation, where the soils suit it, and is also found scattered among other grasses where the conditions are less favourable. The stems are from three to four feet high, somewhat bare of leaves and producing at the top rather large brown spikelets. The absence of the leaves on the stem is abundantly compensated for by the leafy character of the shoots at the base, which yield excellent "green bottom." Like most African grasses, where veld burning has been constantly practised it grows in tufts or bunches. If cut at the proper time it makes an excellent hay, which is highly nutritious to stock.

Other good native perennial hay grasses are the several species of setaria, commonly known as Rhodesian Timothy, and a few species of panicum where found in sufficient quantity. The annual red-top grass found growing on old lands that have lain fallow for some time is valuable for hay. This grass, to get the best results, should be cut in

Exotic grasses. From left to right: 1. Teff grass; 2. Boer manna; 3. Sudan grass; 4. Kinvarra oats. Agricultural Experiment Station, Salisbury.

Indigenous grasses at Agricultural Experiment Station, Salisbury.—From left to right: 1, Gonya grass; 2, Paspalum scrobiculatum—native paspalum; 3, Golden Timothy—Setaria aurea; 4, Guinea grass—Panicum maximum; 5, Rooi grass—Themeda triandra; 6, Rhodesian blue grass—Andropogon gayanus.

the first stage of flowering—it then contains the largest percentage of nutriment. If left until it is in full bloom, the flower heads fall off in handling.

Sudan grass has been grown with marked success in Rhodesia. It is a very vigorous and drought-resistant annual; it succeeds best in seasons of moderate rainfall and is chiefly grown for hay. It is of no advantage to use this grass for pasturage in the summer season when the veld feeding is good, and it is of no value for winter grazing, as it withers up after the first frost. The aftermath usually provides a useful bite in autumn prior to frost. The seed may be sown with the first rains, and if the season is favourable the crop can be mown twice. Sudan grass takes about three and a half months to mature.

Good oat hay can be grown in abundance if the seed is sown on well-prepared soil during January or the beginning of February. Early varieties such as Kherson and Burt oats can be recommended, and should be planted at the rate of 60 to 70 lbs. per acre. The crop should be cut for hay when in full flower, or before if it is attacked by rust; frequently it produces a second growth which is useful for grazing.

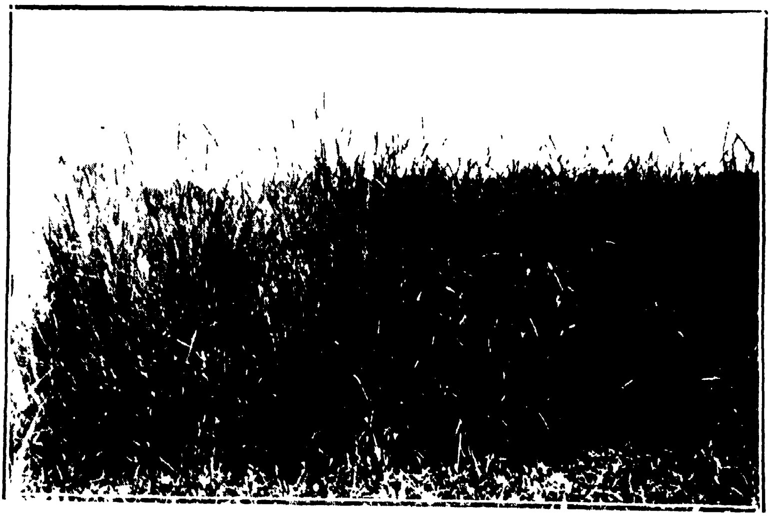
There is also a number of introduced legumes, such as kaffir, velvet, dolichos beans and beggar weed, which, when cut green and made into hay, are nutritious and palatable and readily digested by all classes of stock. Dairy cows especially respond to the nitrogenous matter contained in legumes by yielding liberal quantities of milk. Vigorous growing legumes, such as velvet beans, should be cut for hay as soon as the first pods are formed; at this stage of growth the vines are less wiry and all foliage is still green. Later than this period they are sometimes attacked by leaf spot or rust, and the plants grow woody. Because of their coarse habit of growth they are somewhat difficult to cure satisfactorily for hay. A good plan to follow in curing is to allow the plants to lie in windrows until well wilted (but not until the plants become brittle) and fork into cocks. Care should be taken to see that the cocks are so constructed as to admit of thorough ventilation in order that the hay may not mould and spoil. The dried hay should be handled as little as possible in curing and carting to the stack, in order that the leaves may not be broken off and lost.

Given fine weather, hay-making is a simple process in Rhodesia. The only special implements required are a mower and a horse rake. Natural veld that has not been burnt or grazed in previous years, and if intended for hay, will be greatly improved by burning off the old grass just before the rains, otherwise the fresh grass gets contaminated with old dead grass, which not only clogs and blunts the knife of the mower, but, after being cut, is raked up together with the new hay, thereby reducing the quality. If at the time of cutting there is abundance of sunshine, the rake should follow the mower and the hay raked evenly into windrows, as grass lying in swaths is quickly bleached by the sun. If the crop is heavy, the windrows may require turning over the same afternoon or the following morning after the dew is off. The main object to be secured in hay-making is to get the moisture in the grass evaporated as quickly as possible, while still preserving its greenness.

For home consumption it is advisable to store the hay in stacks instead of baling it direct. A rectangular stack ten yards long by five yards wide carried up to nine or ten feet at the eaves and then "topped" with a sloping roof will be a convenient size and will hold about 20 tons of hay. About 15 lbs. of salt per wagon load sprinkled over while stacking will be found advantageous in rendering hay attractive to stock if it is not naturally so; but well-cured, aromatic hay derived from grass of good quality should not require this preservative and condiment.

Para grass. Agricultural Experiment Station, Salisbury, 1926 27.

Digitaria melanjiana Melanje grass.



Golden Timothy - Setaria aurea.

Extracts from the Report of the Dairy Expert for the Year 1926.

Dairying Season, 1926.—The dairying season of 1926 was characterised by rainfall above normal during January, February and March. From March onwards, however, to the end of the year the rainfall was below normal. The winter was cold, and cattle generally were in poor condition at the beginning of October.

The cold winter and the fact that most winter feed had been consumed caused a serious falling off in supplies of milk and cream during October, November and the first half of December, and this affected the total production of dairy products, which at one time promised to be a great advance on that of 1925. The falling off, unfortunately, in the last quarter of the year was so serious that for a short time it was necessary to re-import both butter and cheese from the Union. Nevertheless, the production of butter for the year constitutes a record, and shows an advance of almost 18 per cent. on our previous record year, 1925.

The cheese production suffered because of the fact that very little cheese was made from July to the middle of December. The shortfall, however, when compared with the previous year's figures, is almost negligible.

Dairy Legislation.—The Dairy Produce Act of 1925 came into operation on the 1st January, 1926. The operation of this Act has extended the scope of the duties of officers of this division, because inspection duties and the checking of grades and tests of cream sent in by farmers to the various creameries have necessitated a good deal of extra work and extra travelling. It is to be hoped that the application of this Act will create a greater degree of confidence between creameries and cream suppliers and that it will do much to place the dairy industry on a sound basis. At the same time the application of this Act will tend to raise the standard of our dairy products. This will be essential if, as appears

likely, Southern Rhodesia is to compete in the overseas markets, where the older Colonies and other countries have so firmly established themselves.

Dairy Stock.—It is gratifying to be able to report that improvement in the breeding and condition of dairy stock continues to be made. Better bulls from a recognised milk strain are in constant demand, and the services of the newly appointed Stock Adviser are enlisted to this end. The Friesland breed continues to be the most popular of our milk breeds, largely because of the ease with which bulls can be obtained and because of the fact that the enlightened policy of the Friesland Cattle Breeders' Association in sending cattle to our shows to be sold without reserve has begun to bear fruit.

Other milk breeds such as the Ayrshire and Red Polls are also in demand, but at present the number of good animals of these breeds available either in this Colony or in the Union is extremely limited, and prices are as a rule high. Animals of these breeds thrive especially well on our lighter soils, and their more general adoption where opportunity offers is greatly to be recommended. Farmers, however, are not supporting the Government loan scheme for the purchase of dairy stock to the same extent as was anticipated, and there seems to be a regrettable tendency to disregard the more reliable system of "mixed farming" for the more speculative one-crop system, e.g., tobacco or maize growing, and to look upon dairying as a mere side-line.

The treatment of dairy stock continues to receive attention, and although some improvement in this respect can be seen, yet this improvement is slow. Although in some cases a good revenue is derived from dairy stock, very little is done to improve the conditions under which the cows are housed and milked. The calves are often neglected and the cows milked in an open kraal, with all its attendant discomfort in wet weather. The attitude of such farmers is difficult to understand, because in practically all cases they are fully aware of the benefits to be derived from a milking shed and from the common sense treatment of calves.

Fencing, both of boundaries and paddocks, is urgently required on most farms. The expenditure on wire is easily recoverable by the increased return from milk and cream and

the saving effected by the lack of necessity of employing so many herd boys. Where dairy cows are kraaled at night they cannot possibly do themselves justice, as it is unnatural for them to graze in the heat of the day. Every effort, therefore, should be made to provide at least one paddock in which animals can graze under natural conditions.

The treatment of calves does not yet receive sufficient attention. It should be remembered that the heifer calves constitute the future generation of dairy cows, and the provision of clean warm shelters and some dry concentrate mixture, such as mealie meal, bran and nut cake, in addition to the milk, will be money well spent.

The demand for locally bred dairy females is constant, and farmers who, because of their distance from the rail, cannot take up dairying should cater for this demand. Good grade dairy heifers and cows are being freely sold at from £15 to £20. This is certainly more remunerative than breeding bullocks at from £4 to £8 apiece.

Milk Recording.—The Rhodesian milk recording scheme is gaining further support as the necessity for fuller information as regards milk production in the breeding of bulls is more appreciated. The cost of milk recording in Rhodesia is negligible, but the fact that such records are available puts anything from £10 to £30 on to the value of a bull. The number of herds recorded during 1926 stands at 18, and the number of cows recorded is 112.

In order to encourage a greater degree of accuracy in the compilation of records, daily weighing books are being issued to farmers free of charge. The daily weighing and recording of milk produced per cow certainly constitutes a tie, but it is only where daily weighing is practised that we can hope to have our records recognised as official. Negotiations with this object in view are being conducted with the Friesland Cattle Breeders' Association. Although milk recording in Southern Rhodesia has proved that, with good cows and careful handling and feeding, high-producing qualities are possible, yet the average milk production is still abnormally low. Better bulls and better treatment of young stock are essential if our average return per cow is to show an increase. At present it is feared that the tendency generally is the reverse, as farmers are only too apt to

indulge in the practice of under-feeding and over-milking. The young stock are suffering in consequence, and of course the effect of the practice is cumulative as one generation of stock succeeds another.

Creameries.—The number of creameries required to be registered under the Dairy Produce Act stands at the same number as last year, viz., seven. Each of these creameries has had a successful year, and in practically every case their production of butter constitutes a record. Perhaps the most noteworthy increase is in the case of the Farmers' Co-op. Creamery Depot, Salisbury, where the quantity of butter fat received shows an increase of practically 50 per cent. on the previous year's figures.

The amount of cream received and the bright prospects of Mashonaland as a dairying country justify the initiative of the board of directors of the Farmers' Co-op. in establishing this depot four years ago and equipping it with a hand churn for the production of butter for local consumption. Since this modest beginning this creamery has shown marked expansion year by year. It is now equipped with a power churn and small cold storage, but these facilities are now too limited to cope with the ever increasing supplies of cream, and it is to be hoped that provision will be made for a greatly needed equipment more capable of manufacturing butter for the overseas market. In this connection it is interesting to note that a large portion of a consignment of butter sent to London during the year was manufactured at the depot and that this butter obtained a good report from the London agents.

The expansion of this creamery has only been made possible by the development of dairy farming in Mashonaland, and it is noteworthy that, in addition to the production of the major portion of the cream in Southern Rhodesia, Mashonaland has produced practically all the cheese manufactured in the country.

The Gwelo Creamery has also had a record year, and it is pleasing to note that the extensions recommended in the annual report for 1925 have now been carried out. New cold storage rooms have been built and the creamery building itself has been extended and more suitably equipped.

The Rhodesia Co-operative Creameries, Ltd., Bulawayo, has also had a most successful year, and is now in a sound financial position.

The Model Dairy, Bulawayo, after another successful year's working, has also been extended and well equipped. Further extensions are contemplated in the near future, and it appears that the expansion of business well justifies these projected improvements.

The smaller creameries, such as Kay's Creamery, the Royal and Vailima Dairies, Bulawayo, and the Lal Bagh Dairy, Gwelo, also have been extended and more fully equipped.

All these extensions, involving large expenditure of capital, are justified by the expansion of the dairy industry and point to the fact that this branch of agriculture is now firmly established in the Colony and that the prospects for the future are most promising. The price of butter fat throughout the year has remained firm and has ranged from 1s. to 1s. 9d. per lb. for butter fat of first grade quality. Many farmers who hitherto have made butter have adopted the practice of sending cream to the various creameries. In consequence, the production of farm butter in the country shows a slight diminution from year to year. This is a movement in the right direction, as it is only by the efforts of our creameries, co-operative and otherwise, that we can expect the expansion and development of the export trade both overseas and to adjoining countries.

The production of creamery butter for the year reached the record total of 1,175,000 lbs., thus exceeding the previous year's total by almost 17.5 per cent. The creamery production for 1922 was 280,000 lbs., so that almost exactly four times as much butter was made in 1926 as in the year 1922. The total quantity of butter exported to our various markets was 774,961 lbs., of a value of £55,537. These figures also constitute a record for Southern Rhodesia and show a percentage increase over the 1925 figures of 38 per cent.

Cheese Factories and Cheese-Making.—Progress in cheese-making is still being made, and during the earlier part of the season £800 worth of Rhodesian cheese was exported to the Union. Unfortunately, owing to the pro-

longed dry season, many factories ceased manufacturing cheese in July and did not open again until December. The total production suffered accordingly and was further restricted by the closing of two factories and the establishment of only one small factory to take the place of those already closed. Each of the factories in full working showed, however, an increase in output over last year's figures, although, as has been stated, the aggregate of production was slightly less.

Markets for Rhodesian cheese were found in the Union, the Congo, Northern Rhodesia, Portuguese territory and Nyasaland. The price, however, was affected by over-production of cheese in the Union, with a consequent lowering of values.

The quality of Rhodesian cheese continues to show improvement, although in some factories better cheese curing rooms and better conditions in the making rooms would further add to the improvement which has been noted in previous years. The establishment of a larger central storage station, where cheese could be graded and stored during the scarce season, is urgently required. The storage of cheese under conditions of controlled temperatures is especially necessary from the beginning of September until the end of November, and it is gratifying to learn that plans to provide this necessary storage are likely to be considered in the near future.

The total production of farm-made cheese during 1926 approximates to 130,000 lbs. No cheese at present is made in the Co-operative Creameries, owing to the difficulty of obtaining a sufficiently large quantity of milk to justify the employment of a full-time cheese-maker.

Poultry Husbandry.

ADVICE TO BEGINNERS.

By A. Little, Poultry Expert.

[*This article appeared in the* Rhodesia Agricultural Journal *for August,* 1925. *We publish it again in response to numerous requests and because there are no copies available of the* Journal *in which it appeared. It is well that such an article should be reprinted, for many, especially recent arrivals in the Colony, have not had an opportunity of reading the excellent advice which is given. We commend the article to the careful perusal of all whose knowledge of poultry-keeping is limited.*—Ed.]

There are many pitfalls in the path of the poultry-keeper, and especially in that of the beginner. The majority think that poultry-keeping is an easy way of making a living; it is not more so than any other business. There is much to learn, there are difficulties to overcome, constant work and perseverance are necessary, it is a business that demands method, system and attention to small details, constant supervision is required, and it is an all-time job. The idea that anyone can farm poultry successfully is a vast mistake, and the man who without any former experience thinks he has only to buy the fowls, have the necessary buildings erected, leave most of the work to others, to sit down and the money will roll in, never made a bigger mistake; even a man with experience who runs a poultry farm on these lines will most assuredly fail.

One may be absolutely ignorant of poultry-keeping, but will do well if he or she is prepared to study and work and gain all the experience possible. Far better the man who is ignorant of the work when he starts, but who is willing to learn, than the one who has a little knowledge, but thinks

he knows everything. The former will be a successful poultry farmer—the latter a failure.

Theoretical and practical work should always go hand in hand. Every poultry-keeper should study the poultry Press and subscribe to some good poultry magazine, chiefly in order to keep up to date as to what is happening in the poultry world, though he should not follow blindly everything that is written, but weigh the pros and cons carefully and sift the wheat from the chaff before adopting any new methods. He should also remember that what may be good advice for England and America, etc., is not so for Rhodesia, for the conditions are very different. How often do we come across poultry-keepers whose birds probably are not doing well who, instead of finding out the cause and remedying it, try blindly first this and then that on the advice of friends or writers in the poultry papers? There is nothing more fatal to success than such chopping and changing, whether it be in breeds, housing, feeding or anything connected with poultry-keeping, and a very common mistake indeed is the chopping and changing of breeds. We frequently find people keeping a certain breed for, say, six months, and, being dissatisfied with the results, get rid of it and start another, with the same result at the end of the next six months. Of course, the fault is never that of the poultry-keeper (nine times out of ten it is); it is the breed that is no good. Provided the birds have been properly selected in the first instance and properly treated, *any* breed will respond satisfactorily and show good results.

The beginner must be prepared to give strict attention to details at all times; what should be done to-day should never be left till to-morrow. If a water vessel is leaking, immediately replace it with a sound one, otherwise the floor of the house and the scratching litter will become damp, and dampness is the precursor of all roots of ills among poultry. If there is a hole in the wire netting it should be mended at once, otherwise the hens become mixed, start fighting and thus injury and loss of eggs is the result, and so on *ad infinitum*.

The right thing too should be done at the right time; there are probably no live stock more susceptible to irregularity of feeding, etc., than fowls. Meals at irregular hours, cleaning at irregular hours, etc., puts them off laying, and

any sudden change in food, methods of feeding, treatment, etc., has the same effect.

Procrastination is a very bad fault in poultry-keeping, and may be the cause of endless labour and loss of money. The poultry-keeper must be observant and be able quickly to note, for instance, whether a bird is off colour, whether she is laying or not, whether the chickens are thriving or not, whether the birds are uncomfortable or overcrowded at night, etc., and act immediately; to remedy such points it will probably mean to him the saving or losing of pounds.

There are many poultry-keepers who with 20 or 30 fowls did well, but when they increased these to 120 or 130 the reverse was the case. The usual cause for this is lack of observation. To many it is possible to run the eye over 20 or 30 birds and see that they are all in good condition and have what they require to keep them so, but when it comes to 120 or 130 they are apt to miss two or three that may be developing some disease, probably an infectious one, and the mischief spreads before they are aware of it. A frequent cause too for failure with a large number where a few have been kept successfully and profitably is that the owner overcrowds the larger number and does not notice it, or that the ground is becoming tainted and measures are not taken to remedy this; the result is sickness and decrease in the output of eggs.

The beginner must be prepared to take a constant and sustained interest in his fowls. Enthusiasm and interest for the first few months and then slacking or irregular interest and much of the work left to others is fatal to success; it is far better never to take up poultry-keeping at all, and the beginner is strongly advised that unless he is prepared to take a constant and continued interest in the work, to leave it severely alone; he will save much money and disappointment by doing so.

We often hear the remark, "Poultry farming does not pay," and numbers of instances are quoted of men who have started and after a time have given it up as a failure. Why? In every case the failure has been the result of their own ineptitude, carelessness, laziness, etc.

The poultry-keeper to be successful must run his poultry as a business; he must know whether that business is paying

well or not—he must always know how he stands financially with regard to it. In other words, he must keep accurate accounts, not necessarily intricate or elaborate ones. A day book, a cash book and a ledger is all that is necessary; simply a debit and credit account, *i.e.*, a list of outgoings and one of incomings, adding, of course, to the latter eggs and birds used in the house as well as those sold. These should be kept from the commencement, for if not, one is apt to spend too much money in the initial stages, *i.e.*, buying unnecessary appliances, erecting too many houses and runs, for many are required only at a later date, when the returns come in and the birds have made the money to pay for them. Such initial expense and unnecessary labour are less likely to be incurred if accounts are kept and it is seen how the money is disappearing. Unnecessary expenditure of capital in the initial stages has often been the cause of failure.

The same remarks apply to buying stock as they do to expending money in building, etc. In this the poultry-keeper must be very careful and be content to go slowly. If he has not obtained the necessary knowledge required to distinguish a good bird from a poor one, he should do so as quickly as possible before purchasing, or get someone he can rely upon who has the necessary knowledge and experience. Care should be exercised on this point, for many whose opinion is worth little or nothing are willing to give interested advice on the selection and purchase of birds for friends and off-load stock that is no good.

There are many opportunities of buying good stock at a very reasonable price, often less than its value; there are also many occasions where veritable rubbish is bought at a high price. In the case of the latter, no matter how well the purchaser houses and cares for them, they will never be profitable, and his ardour is damped at the outset. It is therefore very obvious how extremely important it is for the beginner to know what he is buying and commence with good stock.

Unfortunately there are many pitfalls for the unwary and the beginner. One has to beware of the advertisement columns, in which all is certainly not gold that glitters, and the unduly puffing advertisement. One often hears the assertion, "My birds are of such and such a strain," or sees

advertisements of a similar nature. This is frequently misleading. For instance, take Padman's strain of Utility White Leghorns. He was an Australian breeder who for six or seven years, by careful selection, mating and line breeding each year, built up and produced a family of strong, vigorous, highly-productive birds. Many of these birds and their progeny changed hands and received in subsequent years anything but good treatment—certainly not the good treatment their originator gave them. They were still of the same strain (some were mixed with other strains), but under poor treatment they deteriorated, although pure Padman strain, or in the case of those mixed, partly Padman's strain. Nature never stands still; she either improves or deteriorates. Many strains of fowls have, it is sad to relate, deteriorated till there is no resemblance to the originals, and yet we often see advertisements: "Pure Padman's strain" or "So and so's strain." The poultry-keeper, therefore, should be very careful when buying birds so advertised, for it does not for one moment follow that because such are advertised as of some noted strain they are good birds; in fact, they may be absolute degenerates. As an instance, the following is one of many similar cases:—A certain poultry-keeper bought a good pen of birds from a well-known good breeder; the pen in the breeder's hands did well; the fowls and the chicks hatched from it in the hands of the purchaser did badly, for the reason that they were not properly reared and looked after. They were, be it noted, of the same strain, but poorer than their parents. When the chicks were adults they were mated and mated wrongly; the progeny were still worse—a rapid deterioration. They in their turn were poorly reared, and as adults did still worse, showing very little resemblance to their grand-parents produced by the originator of the strain.

On the other hand, good birds of a good strain are improved in the hands of a careful poultry-keeper who knows his work. There are therefore two aspects to be considered, viz., the one in which the purchaser buys poor birds (with or without the knowledge of the seller), said to be from a certain strain, for often much more than they are worth, and the result is disappointment and loss for which the seller is to blame. On the other hand, the purchaser buys good birds at their right value (or often, if the seller does not know their

value, at less than they are worth), but neglects them or does not treat them properly, with the result again disappointment and loss for which the buyer is to blame. In each case though, rightly or wrongly, the purchaser does not blame himself, but puts it on the seller, who, he tells his neighbours, has "done him down." As an example, a fowl is bought for 7s. 6d. (which some people think a high price); she will cost 5s. per year if kept in a pen for food and attention. Say, with proper treatment, she produces only 60 eggs in a year, and these are sold at an average of 2s. 6d. per doz., she has brought in no profit, and having only laid 60 eggs, she is not worth breeding from. Say, on the other hand, a bird is bought for 21s. and she produces 204 eggs in the year, *i.e.*, 17 dozen eggs at 2s. 6d., or £2 2s. 6d., less 5s. for food and attention (and a good bird will cost no more than a poor one), she thus gives a profit of 12s. 6d. on eggs produced, plus her value as being a good breeding bird of good layers from which many can be obtained. Surely she is not dear at 21s. By examination of a bird it is possible to tell how many eggs approximately she will lay in a year, given proper treatment; this is a point many purchasers overlook when buying birds. They should become perfectly *au fait* on the points of a good layer and strong vigorous bird before doing so, or get some one that is to assist them. When buying, it is advisable to do so from a recognised breeder—one who knows his work and is reliable. By making enquiries this can be easily ascertained. Write and say what you want, and remember that it is better to purchase 12 good birds at 21s. each, that are worth this, than 36 as 7s. 6d. each and only worth that sum. Many buy at a market—a most risky practice. Birds sent for sale to markets are often, one regrets to say, suffering from some disease; in any case, they are usually sent there when no longer of any use and for killing purposes, although sometimes a poultry-keeper who is giving up poultry sends them in in order to sell quickly. In such cases some good birds may be picked up, but each must be examined before being purchased. Sometimes a poultry-keeper hears of a beginner wishing to buy fowls, and offers some of his "good ones at a reasonable price" to start him with good stock. Very philanthropic of him; but the advice again to the poultry-keeper is: beware, and examine carefully before buying.

The number of poultry-keepers who are keeping records and pedigrees is on the increase, and to such purchasers should apply in the first instance; they are in the business to stay, know what their birds are doing, and their value, and above all, can give definite data as to their quality. Even in this instance the purchaser must not take everything for gospel, for it is often easy to write or type a pedigree and record which does not apply to the bird sold.

Purchasers obtaining birds from a distance should arrange for them to be sent on approval. A reliable seller is usually willing to do this, provided he is sure of them being properly treated and cared for at the hands of the purchaser; if not approved of, they should be returned by the would-be purchaser *immediately.*

Many beginners decide to start with cheap, ordinary or poor birds, often cross-breds or mongrels, with the idea that they will gain experience with these, and ultimately switch on to good pure-bred ones. This is so much time wasted; it is far better, much more profitable and time is saved by starting with good ones, but before doing so some theoretical experience should be gained by reading and visiting successful poultry-keepers and gaining knowledge from them and watching their methods. In any case only pure-bred birds as far as possible should at any time be kept. Pure-breds and their progeny are always pure-breds and much more valuable. Cross-breds and mongrels and their progeny will always be the same, and are often not worth more than killing price. There are far too many of these in the country, and elimination of all would not be much loss. We want quality rather than quantity; highly productive good birds rather than scrubs that eat as much of the country's products as do the good ones, with a fraction of the return.

In many instances the poultry-keeper has a number of fowls, but has kept them only in a desultory fashion, never having recognised in them a source of income and good profit, but who, having at last realised this, wishes to take up poultry-keeping on business lines and proper methods. This applies principally to the farmer and plot-holder, who have possibly a large number of fowls of all qualities. Such a person naturally does not wish to reduce his stock to one pen only, therefore he is advised to adopt the following pro-

cedure:—All the fowls should be examined shortly before the breeding season commences in March; the best layers, strongest and most vigorous of the pure-bred birds, selected and mated to a vigorous young cockerel which shows the points of a breeder of good layers. The next best should be chosen as a reserve in case any accident happens to the best, and the remaining cockerels sold for killing. If two such are not available, all should be sold and two good pure-bred ones purchased. The remaining good pure-bred hens (after the best dozen or so are chosen), together with the cross-bred hens which from their points prove good enough to produce eggs in an appreciable number for market, should be kept, but apart from the breeding birds. The remainder, *i.e.*, the poor and unprofitable ones, should immediately be sold off for killing. In other words, the very best birds only should be bred from; the medium ones run without a rooster to produce unfertile eggs for the market, and the worst ones got rid of at once. If there are no pure-breds to choose from or none is good enough for breeding from, a breeding pen of good birds should be purchased with part of the proceeds of the sale of killing birds.

From the birds chosen for breeding from, and from them alone, every chick possible should be hatched from April to 31st August, and when the pullets of these commence to lay later, every bird which was originally discarded as not good enough to breed from, but was retained for market eggs, should be sold off, leaving only the good pure-bred birds. One breed only should be kept.

With the money obtained by sale of birds, better housing, etc., in addition to cockerels or breeding pen originally purchased, can be indulged in, and thus a fair start made on proper business lines. The prospective poultry-keeper holding a post should not give it up, but keep it and attend to his poultry in his spare time (mornings and evenings, Saturdays and Sundays), until such time as he realises that he knows the work from A to Z and that it is so built up and of a sufficient paying character as to keep him. Then and then only should he give up his post and extend and carry on his poultry business to the best of his ability.

The poultry-keeper's motto should be "Economy in everything except food," and this should always be of the best quality.

Maize-growing Competition.

[*The following report has been sent to us by the Maize Association for publication.*—Ed.]

It has been realised for some time past by the Executive of the Rhodesian Maize Association that it is becoming more and more difficult to produce maize at a profit owing to the steadily increasing cost and shortage of labour and to the fact that the price realised for our maize has not risen in proportion to the increased cost of production.

It was felt that if maize growing was to continue as the main agricultural industry of this country, better methods of production and marketing would have to be employed and that there were three main lines on which investigations should be carried out without delay.

1. The question of the marketing of our maize was thoroughly gone into, and at the Bulawayo congress last year the Maize Association introduced a resolution asking the Government to institute a Control Board for the marketing of our maize. This resolution was passed unanimously, all sections of the farming community realising that something of the sort was of vital importance to the maize growers of this country.

The Minister of Agriculture and Lands recently called a conference of maize growers, representing both co-operators and non-co-operators, which by a large majority asked the Government to pass the necessary legislation to impose a levy on all maize produced for sale in this country. This levy will be borne entirely by the maize growers themselves and ought to cost the Government nothing.

2. The question of labour-saving machinery was considered to be a matter for the Government to undertake, and the Executive of the R.A.U. brought forward a resolution at the last annual congress at Bulawayo asking them to go into the matter and give demonstrations at the Gwebi Farm

and elsewhere. Suggestions were made to the Minister of Agriculture and Lands as to the lines on which these investigations should be carried out.

3. It was considered that increasing the yield per acre would go a long way towards saving the situation, and the Maize Association decided to tackle this question themselves, without asking the Government for any assistance, and with this object in view they instituted the maize-growing competition, results of which are appended below. It was felt that we ought to do what we could to help ourselves, and if the information gained as the result of this competition proved of value, we could then approach the Government and ask them to help us in the future, not by putting up prizes for successful competitors, but by arranging for the agricultural experts to visit and report on the competition plots during the growing period.

It was also realised that hitherto the majority of us have been carrying out what experimental work we have done in rather a vague and haphazard fashion. A farmer buys a few tons of fertiliser and applies it to his land—as a rule, with beneficial results. Next year he hears of another kind of fertiliser and tries that, but owing to different climatic conditions it is impossible for him to make a true comparison between the two; or he tries the two kinds in the same year, but more likely than not on different classes of soil. He probably does not know his exact acreages and probably does not reap and shell them separately. The result is he does not derive any definite reliable information as to the right fertiliser to use on his particular soil or soils to give him the greatest economic returns on his investment. It was thought that by inducing him to enter two or three plots in a maize-growing competition he would derive a lot of valuable information as to the best treatment for his own particular soils, and it was hoped that the experimental habit would be instilled into him.

It was decided that for the first year the rules governing the competition should be as simple as possible and that the competition should be open to the whole country, though it was realised that as a result of this year's competition it might be necessary to differentiate between sand veld and formation soils in future competitions. The size of the plots

was fixed at two acres, each measuring 70 yards x 140 yards, and each competitor was limited to three plots.

No irrigation or hand watering was allowed.

No stocking was allowed.

Reaping and shelling of the plots had to be done under the supervision of two of his competitors.

Each competitor had to fill in a paper giving particulars as to the manurial treatment of each plot, also the crops grown and treatment given for the three preceding years and all particulars as to the various ploughing, harrowing, planting and other cultural methods employed on the competition plots.

An entrance fee of £1 was charged for each plot entered. The amount thus raised was pooled, and after deducting 10 per cent. to cover expenses, 45 per cent. was awarded to the winner of the first prize, 20 per cent. to the second, 15 per cent. to the third and 10 per cent. to the fourth. In addition to these cash prizes, some of the leading merchants of Salisbury, who fully realised the value of such a competition in promoting the prosperity of the farmers, very generously donated handsome prizes as below:—

Anglo-African Trading Co., 3-furrow Deere disc plough.

Anglo-Continental Guano Works, Ltd., one ton fertiliser.

William Bain & Co., Ltd., 2-row Deering planter.

Bechuanaland Trading Association, 3-furrow Ransomes' disc plough and one drum Kerol.

Messrs. Capex, Ltd., Bailey's Cyclopædia of Agriculture.

A. F. Philip & Co., McCormick cultivator.

Stewarts & Lloyds, goods to the value of £5.

E. W. Tarry & Co., 3-furrow Sunny disc plough.

A total of 169 plots was entered, but for various reasons only 51 completed returns were sent in, which is a fact very much to be regretted.

A sub-committee was appointed to analyse and tabulate the results. The table below and report were drawn up by

Mr. T. J. Mossop and confirmed by the rest of the committee. Neither Mr. Mossop nor Mr. Husband, the Agricultural Chemist, was able to draw any definite conclusions as to the results of the various manurial or fertiliser treatments given the plots, which may possibly be accounted for by the fact that it was a season of low rainfall with two periods of drought during the growing period.

This also probably accounts for the fact that no phenomenally high yields were recorded. During the growing season several associations organised tours of inspection of the various plots in their areas by Messrs. Mainwaring and Husband, of the Agricultural Department, who were accompanied by the farmers of the district. These tours were of great interest to those farmers who attended, and it is to be hoped that in future all farmers' associations will arrange tours on similar lines.

All the returns sent in have been classified, and the result shows that Salisbury White seed, with the exception of the plot grown on alluvial soil by Messrs. Macdonald Bros., has secured all the prizes. Three of these were claimed by the Enterprise district, two by Salisbury and one each by Eastern Fort Victoria, Poorti Valley and Shamva.

A closer examination shows that these Salisbury White winning plots were with one exception on red or chocolate diorite soils, the exception being that of Messrs. Wheeler Bros., which has been classed as black alluvial vlei or black turf soil.

In the group of returns, from the tenth to the twenty-first plots, Glendale appears nine times, mostly with Hickory King. The yields in this area vary from a maximum of 54 bags 193 lbs. to a minimum of 49 bags 122 lbs. in the eleven plots. This is a most remarkable uniformity and is in keeping with the well-known evenness of soil and lack of pockets in the Glendale area. The other two plots in this group are one of Mr. J. Rademeyer, Eastern Fort Victoria, and one of Messrs. Wheeler Bros., Salisbury, which was unfertilised and taken as a control.

From this point to the end of the 51 plots analysed there is no characteristic which immediately strikes the eye, as all competing districts are represented at intervals in the "tail."

Where four returns or over have been sent from a single farmers' association area the results have been analysed and the following averages obtained:—

Glendale Association—12 plots: 50 bags 53 lbs. per plot.

Enterprise Association—9 plots: 49 bags 146 lbs. per plot.

Salisbury Association—8 plots: 48 bags 149 lbs. per plot.

Marandellas Association—4 plots: 29 bags 121 lbs. per plot.

Rest of Rhodesia—17 plots: 39 bags 142 lbs. per plot.

Unploughed plot, Glendale—1 plot: 34 bags 160 lbs.

It should be noted that in addition to the plots from which the average for Glendale was taken there was one plot—that of Mr. F. Webb—which had been planted on unploughed ground and yielded 34 bags 160 lbs. The plot was marked out as being a representative portion of a 50-acre field similarly untreated, and was introduced into the competition for purposes of record.

The average yield under the heading "Rest of Rhodesia" includes four prize-winners from areas not sufficiently represented to permit of a summary being made.

It is to be regretted that an important maize district like Lomagundi was represented by only one competitor.

The following analysis of results was drawn up by Mr. T. J. Mossop:—

Bee-Keeping in Rhodesia.

A STANDARD HIVE.

By T. Savory.

It is a generally accepted fact throughout the industry that there are only two main hives in use as standards, i.e., the English and the American (or Hoffman), and of these the latter or American is from all statistics the one in most general use. Therefore, in its measurements, size of frames and general structure we cannot do better than follow it. There are, of course, numerous makers, each claiming special advantages. Any description of such would occupy much more space than could be spared here. Accepting the Langstroth dimensions as those of the recognised American standard hive, we can get ahead with the suggested Rhodesian model.

The ordinary American hive can be landed in Rhodesia, on the average farm, for, as near as may be, £4, complete with brood chamber, shallow crate, section crate, lids, roof, etc. This hive costs in England about 25s. and in America 10 dollars 50 cents. Anyone, therefore, intending to purchase 10 to 20 hives must be prepared to lay out in the rough hive alone some £40 to £80, according to the number decided upon. These prices do not provide for a double brood chamber, which should be ready at all times for use when occasion requires. As we are aiming for a side-line that can be started and maintained upon a reasonably small initial outlay, this style of purchase can hardly be recommended.

In August, 1922, "The Homestead" Supplement of the *Farmers' Weekly* issued its first article on "Bee-Keeping"—a series that covered very thoroughly the rudiments of this industry. From these plans the writer made a complete hive. This first attempt naturally left a good deal to be remedied in the next one; the second was an improvement, and the

third, up to the twenty-fifth, gave and are giving entire satisfaction. The main essential is careful work, so that each part is interchangeable with others. It was found that an ordinary (northern) native carpenter could do most of the work under white supervision at a small cost.

By kind permission of "The Homestead" I quote as follows, which should give a fair basis upon which to build the first hive:—

"Take a petrol box of fairly thick board; remove the sides of the box. There is now only the bottom and two thick ends. To the original top, nail boards; this gives us the top and bottom, which will be the sides of the brood chamber. The original sides of the box are now the open top and bottom. . . . Next fit a strip of wood about $\frac{1}{4}$ in. or $\frac{1}{3}$ in. by 1 in. wide, and as long as the width of the hive inside, to the thick board about $\frac{1}{2}$ in. from the top. This serves as a rest for the frames, and must therefore be firmly nailed down, as brood frames are often filled with honey and need a good support for such weight."

To complete the hive what is known as a super or crate, for shallow frames for the surplus honey, a lid and a roof are required. The super is an open box at top and bottom of exactly the same size as the brood chamber, but only 6 ins. deep, and fitted for the frames to hang on in the same way. The lid is one of from 1 in. to 2 ins. deep, to allow a fair amount of air space above the quilt, and the roof is a simple affair for drainage of the rains, and should be weighted down by stones or bricks. In addition to the foregoing, an extra crate for one pound honeycomb sections should always be ready if and as required. This is a replica of the super, with slats fastened upon the bottom and upon which the rows of sections rest, wide enough apart to allow the bees to pass up and down. As already stated, a second brood chamber is always advisable in an up-to-date apiary and is being increasingly adopted by English and American apiarists as standard.

The usual width of a petrol case is $14\frac{1}{8}$ ins. (though some makes may differ by $\frac{1}{8}$ in. to $\frac{1}{4}$ in. longer), therefore agree the standard width to $14\frac{1}{8}$ ins. and always work to that. The depth is $9\frac{5}{8}$ ins., and as the Hoffman or Langstroth frame is 9 ins. deep, this will leave a space between the frames

and the floor of ¼ in. bee room, and ⅛ in. above the frames to allow for a quilt or for a sheet of queen excluder. The outside length is 20½ ins., with exactly 19 ins. inside, and as the Langstroth frame is 18⅞ ins., this will just allow an easy play when shifting the frames in and out of the chamber. Here, however, we do not keep quite to "The Homestead" specifications, finding that the Rhodesian warm climate requires rather thicker wood than the double one of the petrol sides, and using instead ⅞ in. x 6 ins. flooring boards, the more so as the whole of the sides of the thinner wood is required for the lids, roofs, etc. The hive stand should be made of two strips of 3-in. flooring 4 ft. 6 ins. long and two strips of 1 ft. 6 ins. screwed on to four legs of 2 ins. x 3 ins. wood, allowing for a clear 6 ins. to the ground. The cost of a hive on this basis works out for Northern Rhodesia, excluding labour, as shown below. It should be a trifle lower for Southern Rhodesia on account of less rail charges:—

Hive Stand.—			
1 6 ft. (sides and ends), 6 ft. ⅞ in. x 6 ins.			
1 3 ft. (legs), 2 ins. x 3 ins. ... ... 6d. each	£0	1	6
Bottom Board.—			
1 2 ft. (2 joists), 2 ft. ⅞ in. x 6 ins.			
1 7 ft. (floor), ½ in. x 6 ins. ... ... 4d. each	0	2	4
Brood Chamber.—			
2 ends, petrol box	0	0	6
2 3 ft. 6 ins. (sides), 7 ft. ⅞ in. x 6 ins.			
Super for Shallow Frames.—			
2 ends, petrol box	0	0	6
1 3 ft. 6 ins. (sides), 3 ft. 6 ins. ⅞ in. x 6 ins.			
Super for Comb Sections.—			
Same as for shallow frames, 3 ft. 6 ins. ⅞ in. x 6 ins.	0	0	6
Lid and Ventilating Lid.—			
Made from remnants of ⅞ in. x 6 ins. left over.			
Roof.—			
1 1 ft. 6 ins. (joists), 1 ft. 6 ins. ⅞ in. x 6 ins.			
The last 2 parts are covered with the petrol box	0	0	6
Wood equalling 23 ft. 6 ins. of ⅞ in. x 6 ins. at 6d.	0	11	3

Screws and nails	0	2	0
Paint	0	3	0
Wire netting on ventilator lid	0	0	6
Tar for stand	0	0	6
Balance for petrol boxes (three)	0	1	0
	£1	4	1
Add for own or other labour	0	10	0
	£1	14	1

It might be added that inasmuch as the making can be done at spare times, this item should always be small, as it does not require skilled workmanship; also that portions of the hive can just as easily be made from strong packing cases as from the more expensive imported flooring boards. Petrol rather than paraffin cases are preferable, as the smell of the latter is retained quite a long while and is greatly disliked by bees.

When providing for the hive entrance, a cutting on the bottom front of it should be made along the whole width of the 14 ins., and at least ½ in. to ¾ in. in height; this can be contracted as required, according to climatic conditions, strength of colony, etc., and will be more fully dealt with in a later article. Under this and on a slope, screwed on to the hive floor, should be placed an alighting board, the width of the hive and 3 ins. to 4 ins. in depth; this should be in the rough, i.e., not planed or painted. Bees come home as a rule laden and tired, and a casual glance at an alighting board smooth and painted and one rough and unplaned will at once show the observer the benefit to the worker bee of the latter. Over the top of the entrance a sloping porch or verandah the width of the hive is advisable in the climate of Rhodesia, reaching down some 3 ins. or 4 ins., so as to well shade the entrance from the fierce heat of the sun; in fact, the writer believes, and has proved it to his own satisfaction, that a porch coming well down (and in more than one case so close over it as to leave only just enough space to pass the bees in) quite eliminated, one season, any question of pirates catching their prey at the entrance.

An addition to the hive bodies of much use is a 2-in. thin cleat nailed on to the front and sides, projecting, say,

½ in. over the top of the under chamber. This stops any draughts that might occur and tends to correct any little irregularities that might arise from a trifling error in construction. If one is placed at the back, it should be screwed on—to be unscrewed when putting in the bee escape board when preparing the crate for honey extraction.

It is hoped that the foregoing details of a home-made hive are plain enough for the average amateur to follow, and that he will be encouraged to try his hand accordingly to produce a good and serviceable article at a cost of about 35s. Fittings to the hives, such as frames, foundations, queen excluding zinc, which will be dealt with in another article, can be purchased at quite reasonable rates from any of the firms which advertise them.

SMALL EARTHEN STORAGE RESERVOIRS.

The concluding portion of this article will appear in the November issue of this Journal.

Report on Papain from Southern Rhodesia.

The following report has kindly been furnished by the Imperial Institute:—

The sample of papain which is the subject of this report was received for examination at the Imperial Institute on the 4th March, 1927, from the Land Settlement Officer, Office of the High Commissioner for Southern Rhodesia. It was stated that the papain had been prepared "by incising the unripe fruit and allowing the resulting latex to coagulate and crystallise," and it was desired to ascertain the quality of the material and its commercial value.

Description.—The sample was labelled "Papain (crudely prepared)," and weighed 1 oz. It consisted of powder and small lumps, and was yellowish-brown. It had a slight odour, but was superior in this respect to the commercial samples of papain referred to below.

Results of Examination.—On examination it furnished the following results:—

Moisture	9.4 per cent.
Ash	6.4 ,,
Nitrogen	11.3 ,,

Determinations of the proteolytic activity were carried out by the fibrin method, in which raw beef is employed, in comparison with commercial samples obtained from two leading firms of wholesale druggists. The present material was found to be rather more active than either of the commercial samples, the results being in the proportion of 1: 0-9: 0-8. The sample was free from starch and sugar. With water the material produced a cloudy solution, which was rather inferior in appearance to the solutions yielded by the commercial samples, owing to its having been less finely ground. The cleanness and colour of the papain were approximately equal to those of the commercial samples.

Commercial Value.—A portion of the sample was submitted to wholesale druggists for their opinion regarding its quality and commercial value. They stated that the quantity of material was not sufficient to enable them to give a definite report, but they offered to carry out further tests if a larger sample of about 2 ozs. could be supplied.

The firm mentioned that papain occurs in commerce in two qualities—one of brownish colour, similar to that under report, which is largely used both in this country and the United States, and the other white. The latter is in demand in the United States, and the production is increasing; it is possible that this white variety may eventually supersede the ordinary brown papain entirely.

The ordinary papain from Ceylon is of a pale brown colour, and is at present quoted at 10s. to 11s. per lb. c.i.f. London, according to its proteolytic activity.

Methods of Preparing Papain.—The preparation of papain is usually carried out by the following method:—

In order to obtain the juice, longitudinal incisions $\frac{1}{8}$ in. deep and about 1 in. apart are made in the fruits by means of a knife of bone or horn. The juice that exudes is collected in glass or porcelain vessels held beneath the fruit, and on exposure to the air, quickly coagulates. The coagulated mass is dried either by exposure to the sun or in artificial dryers, and is subsequently ground. Drying should take place rapidly, otherwise some putrefaction may occur, accompanied by the production of a disagreeable odour. This may be obviated by adding a trace of formalin to the juice as it is collected.

In Ceylon the papain is packed either in tins or glass bottles, or sometimes in wooden cases lined with tea lead, care being taken to preserve it from contact with air.

In order to obtain a white papain, care should be taken that the juice does not come in contact with iron, as otherwise the product may be discoloured. For this reason steel knives should not be used to incise the fruits and the juice should not be collected in iron or tin vessels. It is stated that when the juice is dried in the sun a dark-coloured product is usually obtained. The following precautions have been recommended: The juice should be dried as soon as

possible after collection, but not too rapidly; the temperature should not be allowed to rise above 40° C., the final drying being done if possible *in vacuo*. The product, after being ground, should be transferred at once to air-tight stoppered bottles or packed in lead-lined wooden boxes.

In places where the weather conditions are uncertain and drying takes place only slowly in the shade, or when large quantities of juice have to be dealt with, some form of drying apparatus is desirable. On large estates a hot air chamber can be employed, but for the small producer a drying stove as used in Montserrat is more suitable. One form of such dryer consists of a chamber 3 ft. x 3 ft. x 6 ft., the sides and ends of which are built of brick. About a foot from the top the chamber is divided horizontally into two compartments by a sheet of iron; beneath this a small fire grate is constructed, whilst at the opposite end a chimney is built to lead the smoke from the lower compartment. In order to obtain an even heat in the upper compartment a layer of sand about 2 ins. thick is spread on the iron sheet. The coagulated juice is spread on brown linen stretched upon frames which are made to fit the top of the dryer. The drying must be effected at a comparatively low temperature, as otherwise the ferment is liable to be destroyed. As already stated, the temperature should not exceed 40° C. Cocoanut shells or charcoal are used as fuel in this dryer, and the operation of drying is completed in about six hours. It is stated that in this way a nearly white papain can be obtained.

It has been stated by Pratt (*Philippine Journal of Science*, Ser. A, 1915, Vol. 10, p. 1) that if, in collecting the juice, care is taken to ensure freedom from foreign matter and the fresh juices are dried promptly before decomposition sets in, there should be no difficulty in obtaining a white papain.

Limitations in Co-operation.

By H. G. Wheeldon, Assistant Poultry Expert.

Much has been written from time to time in connection with the possibilities of co-operative marketing, and oddly enough some very definite limitations are often believed to be possibilities. For instance, there are perhaps no two ideas more widely prevalent among farmers than that a strong co-operative organisation should be able to "fix prices more or less regardless of the supply and demand"; and that co-operation will "eliminate the middleman." Yet both of these ideas are largely impossible, and are what might be termed positive limitations. There are other limitations which are probably more in the nature of difficulties which competent management is likely to, and very often does, overcome. A farmers' organisation cannot "definitely fix" the price at which the product is to be sold and sell all its produce unless the price also suits the consumer. It recalls the old saying of not being able to make a horse drink after having led it to the water. The consumer holds the purse strings, and if the price is too high he will buy less—perhaps a little less, perhaps much less, but always less. It should be remembered that there is probably no farm produce of which the supply will not increase if the ruling price makes the production of it unusually profitable, as compared with other lines of farming.

In regard to the idea of "eliminating the middleman," what can be done is to replace private business units by co-operative units; also one co-operative organisation may replace a number of individual units, such as local buyers, agents, etc. This, however, is not "elimination"—it is simply bringing a succession of steps under one control; it is integration. As far as can be ascertained, there are no large organisations even which have eliminated any of the important steps in the marketing process, but they may have

brought several steps under one control. It has not always meant lower operating costs, but it has often meant better service, greater control over distribution, etc., and in this way there has been a distinct gain. Co-operative concerns handling perishable products cannot act as retailers only; they must act also as wholesalers, and in this way allow distributors to perform some of the marketing for them. For the same reason individual farmers cannot eliminate these intermediaries altogether.

It is often assumed that co-operative organisations can do business more cheaply than can a private business, because it is expected to eliminate all profits. The important point overlooked by those who hold this view is the fact that profits, in our competitive system, arise out of the very fact that costs of operation have been cut by those concerns which are making profits. A farmers' co-operation, for example, must hire all their help from manager down to the humblest clerk. In a private business there are usually a number of the owners taking an active part in the management and operation. Any savings in the cost go directly to them. Any savings in the cost made by the manager of a co-operation, on the other hand, go to those who hire him. Consequently he may not be so vitally interested in keeping down costs as is the private business man. Co-operative marketing cannot cut costs greatly.

In addition to these limitations there are a few inherent weaknesses in co-operation which can only be overcome by capable and tactful management if co-operation is to be genuinely successful. The more outstanding of these are:—

It is Difficult for Management and Membership to keep in Harmony.—A co-operative organisation is made up of a group of farmers, each of whom operates an independent business of his own, but all of whom have a common purpose in co-operating. After they have been formed into an organisation each individual continues to go about his own business, while the management proceeds to execute the purposes of the organisation. "There is always danger that members and management get out of step with each other." That is, the producers busy with their own affairs cannot be fully acquainted with the problems of the association; and the management, on the other hand, becomes so engrossed in

the details of management as to lose the point of view of the members. This does not mean that the management fails to keep in mind the interests of the members; it is just as serious, however, from the point of view of harmony and efficient functioning, if the management interpret the needs of the members in a different manner to which the members themselves interpret them. Thus, even if the management is sincere, there is a real possibility for serious misunderstanding if the producers do not understand changes in the policy of the management or if they believe the business is not being conducted according to their original intentions.

There is often a Tendency towards .Extravagance.—The management may quote that a certain expenditure costs a little per unit, but the members later see the lump sum. The piling up of a number of small accounts soon increases the costs out of proportion to the business done. It is sometimes said that an organisation must have a volume of business large enough to carry its overhead expenses. It is just as important, however, that a large organisation with a great volume of business should keep its overhead costs down to a point where it can meet or beat competition.

Outsiders often get higher Prices than Members.—Even with an efficient organisation, outside producers (non-members) are often able to obtain higher prices than members. Such a situation is not entirely a reflection on the efficiency of a co-operative organisation. It is a situation which, however, places some definite limits on what a co-operative association may do. A co-operation does valuable work in building up a market for the future of the industry. The greater the percentage of produce an organisation controls, the greater the likelihood that some of the outsiders will get higher returns than the members get—but not necessarily higher returns than anyone would get if the co-op. association were not in existence. Private buyers may sacrifice on the co-operatively marketed line in order to discredit the association, or more often than not they may wish to supply regular customers with a "full line" rather than they should go to a competitor for a part of their requirements. They may therefore be willing to pay more for the produce than the association gives if it is necessary to get the supply they need.

The Members of a new Co-operation often expect too much.—Seldom can a large organisation be formed without raising hope too high. This is generally followed by disappointment, which only patient and capable management can overcome. The management must not only be efficient, but it must keep its membership; here lies one of the most important functions of the manager of a co-operative association. He must have such a vision of what a strong organisation can do that his enthusiasm becomes contagious. At the same time he must not buoy up his members with false hopes or extravagant expectations, for such are followed by discontent.

Smithfield Prices.

Messrs. Hart, Harrison & Co., 4 and 5, West Smithfield, E.C., kindly supply us with the following prices ruling on 18th August:—

London Central Markets:—Beef.—Home killed and chilled in fair supply and demand; prices firm.

English long sides, 8d. to 9½d. per lb.
Irish long sides, 8d. to 9d. per lb.
Argentine chilled hinds, 7¾d. to 8d. per lb.
Argentine chilled fores, 4¼d. to 4½d. per lb.
Australian frozen hinds, 6d. per lb.
Pork, fresh killed, 8½d. to 11d. per lb.

Cattle Cleansing Act, 1927.

As our readers will be aware, the "Cattle Cleansing Ordinance, 1918," and the "Cattle Cleansing Ordinance, 1918, Amendment Ordinance, 1923," have been repealed and a new Act bearing the above title promulgated. The more important alterations and additions are as follows:—

Section 1 (3).—"Tick infestation": An alternative definition added, viz.:—"five or more engorged ticks on each of five or more head of cattle."

Section 4.—Cattle inspectors are empowered to call owners to produce all their cattle for purpose of inspection and enumeration. Cattle owners are obliged to keep the cattle inspector informed of the dates and place of dipping with a view to facilitating this inspection.

Section 10 (1).—Owners of land on which native owners of cattle reside are obliged to take adequate steps to enforce the dipping of such cattle and to keep a register of all such cattle, showing the names of the cattle owners, the numbers of cattle and the number of cattle dipped on each dipping day.

(2) Owners of tanks providing other owners with dipping facilities are obliged to maintain the fluid in the tank at the strength prescribed by the Act.

Section 17.—Owners of land on which native owners of cattle reside shall furnish a return to the cattle inspector in June and December each year, showing the names of such owners and the numbers of cattle belonging to each owner. Under section 18 a similar return must be furnished by Municipal Councils and Town or Village Management Boards.

Sections 19, 20 and 21 provide for the manner in which samples of dip for analysis are to be taken, the transmission of such samples by post and the certificates of duly appointed analysts as evidence in proceedings instituted for dipping solutions being under the prescribed strength.

Notes on the Tobacco-growing Competition

AT THE TOBACCO EXPERIMENT STATION, SALISBURY.

By C. A. Kelsey Harvey, Manager.

Half-acre plots are cultivated by two apprentices. The work includes stumping the land in the first instance, ploughing and cross-ploughing with a single furrow plough. The fertilising is left to the discretion of the apprentices concerned, guided by the manager, 200 lbs. per acre of a double complete tobacco fertiliser being the most popular for the new land, this being based on previous years' results on the Tobacco Experiment Station.

All the work associated with the fertilising, planting, cultivating, topping, priming, suckering and seed selection is done solely by the apprentices themselves. At curing time the leaf is harvested from the various plots, marked, put into one barn, and one apprentice is elected by his fellows to cure that particular barn; this system is continued until all the tobacco is reaped. Apprentices then grade and pack their own crops and prepare five 5-lb. samples for exhibition, which are finally judged and marks allotted for quality, grading, texture, etc.

The plots are judged several times during the growing season, and points are given for field work, yield, quality and exhibition as a whole, as shown in the following list.

On 30th June the Hon. the Minister of Agriculture and Lands inspected the graded crops and presented prizes to the first and second pair of apprentices with the highest number of marks.

It has been found that this form of practical instruction has been of great benefit to the apprentices and promotes keenness and interest in tobacco growing.

RESULTS OF THE TOBACCO-GROWING COMPETITION.

Half-acre Plots.

Name.	Field work points.	Yield per acre of saleable leaf.	Yield points.	Quality points.	Exhibition points.	Total.
		Lbs.				
L. R. Crampion E. A. Thompson	83	898	23	20	21½	147½
F. C. Luxat C. J. Gibb	82½	936	24	18	21	145½
W. J. Davel W. M. Rennie	77	802	22	15	17½	131½
J. Household O. S. Button	72	566	17	19	19	123
F. Watridge P. Yorke	58½	622	18	15	18	109½
G. F. Crozier A. L. Thompson	59	663	19	13	16¾	107¾
D. O. Cobham F. Scamell	44	856	23	18	20	105
P. C. Bird W. Garside	51½	568	17	15	18½	102
B. Rixon C. J. Wilson	53	580	17	14	16¾	100¾
G. Whyte V. R. Townsend	—	—	—	—	15½	(not placed owing to illness)

Dairy Ranching in Wiltshire.

[*A subscriber has asked us to reproduce the following article, which appeared in a recent issue of* The Field. *We do so, not because we suggest that such a system as that described should be adopted in this Colony, where conditions are very different, but because in our opinion it affords an example of enterprise which must have a stimulating effect upon any primary producer. The reference to the improvement of the pasturage due to the system of paddocking is of special interest to us in this Colony, where similar results have been obtained by fencing and close grazing of the veld.—Ed.*]

Nowadays it is a rare and refreshing tonic to meet a farmer who is making a financial success of his business and who is not ashamed to say so. An afternoon with Mr. Arthur Hosier on his farm at Wexcombe, near Marlborough, in the county of Wilts, is indeed a stimulating experience for any farmer who despairs of the future prosperity of the industry. With his open-air dairies on the Wiltshire Downs, Mr. Hosier has struck out on new lines and he has made a success of his venture. Mr. Hosier has the great advantage of an engineer's training, and he has made good use of his knowledge by applying it to dairy farming. Until the end of the war he and his brother were mainly concerned in corn growing, but, being shrewd enough to foresee what was coming, they then decided that they must change their style of farming so as to consume on the farm all the produce of their land rather than continue to sell off primary products, such as corn and hay. Accordingly seven years ago Mr. Arthur Hosier bought his present 1,000-acre farm on the chalk of the Wiltshire Downs, then mainly poor arable land, with the purpose of converting it into a dairy ranch. His first step was to seed down the arable land to grass and fence off the wide expanses into convenient blocks. He then

started to lay water on to every enclosure, constructing a reservoir at the highest point of the farm and pumping water up from an artesian well at the homestead. In the later stages of this work he came in for grants under the Government drainage and water supply schemes, and this proved of great assistance. To give the pastures a good start an initial dressing of 7 cwts. of equal parts of superphosphate and kainit was chosen after small scale trials of various fertilisers. Then Mr. Hosier turned his attention to perfecting a milking unit that could utilise his grassland to the best advantage. Briefly it consists of a floorless wooden shed on wheels, which is divided into six partitions and fitted with a milking machine plant. A separate caravan contains a small oil engine and pump for the milking plant and a dynamo to provide electric light in the dark mornings of winter. The whole plant can be readily shifted by a tractor. The most economic unit is one bail with 60 cows, and the staff required to deal with this number is one man and one boy. The procedure is briefly this: A small compound, about one-tenth of an acre, is shut off the down by light chestnut pale fencing and the bail brought up alongside. The cows are rounded up into the compound and are then drafted as required into a partition of the bail for milking. The plan is to shift the bail two or three times each week so that the whole of the pasture is covered in the course of a few weeks. The actual milking is simple enough. The cows come into the bail as required, and the boy, after securing them with a chain round their hindquarters, fixes on the cups of the milking machine. The milk is sucked up through a pipe, which empties into a churn at the end of the bail. The man follows the machine to do what stripping is necessary, and then, by pulling up a shutter of the head of the partition, the cow is released and goes off on to the down again. It is Mr. Hosier's practice to give the cows a handful of cake when they are being milked in the bail—this is automatically fed to them out of a hopper—because it is his purpose to keep his cows thriving and to put flesh on them. By buying inexpensive Irish heifers and doing them well for a year or two, he reckons to sell them out for more than he gives for them. In other words, he makes milking stock show an appreciation and not a depreciation while they are in his dairy.

The effect on the pastures of the treading and manuring is really miraculous. Land that is naturally thin and poor has been made to yield grass crops that would be the envy of Midland graziers. In this dry summer the fields that have been shut off from the cows are as full of grass as one could desire. Indeed, it looks as if Mr. Hosier will be the only man in the district to cut a decent crop of hay this year. The mat of white clover on the Wexcombe pastures really is a sight for the gods. He might well claim that he has converted land worth 10s. an acre into land worth 30s. or 35s. an acre. One great economy secured by this system of dairy ranching is in the use of manure. In ordinary practice a large proportion of the most valuable constituents of manure from the cow sheds is lost before it eventually reaches the land. At Wexcombe there is no storage and manure carting to be done. All that is needed is to run the tractor and harrows over the pasture to spread the droppings when the bail moves on to another field. Mr. Arthur Hosier is now milking 300 cows on this ranching system, and sending away some 700 gallons of milk each day. It would not be fair to publish his actual costs of production, but he is producing milk at a figure much lower than anything we have heard mentioned in recent years. There must be very few farmers who are producing milk at a labour cost of under three-halfpence a gallon. Generally this charge works out at nearer fourpence. Mr. Hosier is not only producing cheap milk—he is producing exceptionally clean milk. Nothing could be more hygienic than this open-air dairying, for there is no finer purifier than the sun and the four winds. On the Wiltshire Downs there is little chance of contamination, and Mr. Hosier can boast that he has never had a churn of milk returned to him as sour. The first jet of milk from the cow's teat is rejected before the boy fixes the cups of the machine, and there is no possible chance of the milk becoming contaminated in its passage to the churn, provided the pipes are kept clean. The churns are loaded on to a pony float and taken down to the cooler at the farmstead, and finally the milk is sucked up into a 1,000-gallon glass-lined tank for conveyance by road to London.

Mr. Hosier has several imitators already. In fact, he is kept busy building milking plants for those who have seen

what he has achieved at Wexcombe and who have determined to try out the system under their conditions. The secret of Mr. Hosier's success lies in his own brain. He has engineering experience, he knows the conditions in New Zealand—the home of the milking machine—and above all he has resource and enterprise. The grass he is growing on the thin chalk is a revelation, especially when compared with the poverty of his neighbours' pastures. From the homestead one can look up to the distant downs and see clearly enough where Mr. Hosier's boundary lies. On one side of the fence there is heather and coarse matted grass; on the other as useful pasture as one could desire to see. This change can only be attributed to the beneficial effect of the treading and manuring of the cattle. After five years of treatment under the "Hosier system" the Wexcombe pastures are providing fresh growing grass during eight months of the year. Last winter it was not until mid-November that a hay ration was deemed necessary, and by the third week in March the grass was pushing strongly again. Mr. Hosier is a great believer in keeping the grass closely grazed, and, as recent researches at Cambridge have shown that young grass has a feeding value equivalent to linseed cake, the Wexcombe pastures must be fast becoming a gold mine. We have now visited Mr. Hosier's farm on two occasions—eighteen months ago in mid-winter and now in summer—and we must say that he has evolved the ideal system for making a commercial proposition of the poor thin lands of the southern counties in the present circumstances.

Agriculture and the International Economic Conference.

The International Economic Conference held under the auspices of the League of Nations, which met at Geneva on 4th May, concluded its session on Monday, 23rd May, when it adopted its final report. The conference met to consider the general economic situation of the world, and representatives of fifty nations took part in the deliberations. We have not received a copy of the report, but it will probably be of interest to our readers if we publish some extracts from a review which appeared in the Journal of the Ministry of Agriculture for July.

". . . A feature of great importance was that, for the first time in a conference of this character, agriculture has been represented side by side with commerce and industry; this alone gave emphasis to the fundamental importance of agriculture in the general economic prosperity of the world.

"The work of the conference was divided between three main committees—Commerce, Industry and Agriculture—and the final report includes those prepared by each of these committees and adopted by the conference as a whole. The section of the report dealing with agriculture, and the documentation prepared for the conference, bring out clearly the fact that a widespread agricultural depression exists, not universal and not of equal severity between one country and another, but affecting a large number of those countries from which the world's supply of food and raw materials is obtained. The causes of this depression are complex, and the documents of the conference made it evident that they differ very considerably between one country and another. For example, in those countries where there was a severe post-war inflation, the working capital employed in agriculture almost completely disappeared and the cost of obtaining credit rose to nearly prohibitive figures. Again, the taxation borne by agriculturists had, in some cases, risen to as much as three times its pre-war value. Another factor of great

importance was the change in the political and economic frontiers in Central Europe. . . .

". . . All these facts and many others are shown by the documents of the conference to have profoundly affected the world's agriculture, but not its agriculture alone, for the causes of agricultural depression were largely the same as those which operated against a revival of European industry and commerce. Perhaps the most significant feature of the section of the report dealing with agriculture is the realisation of the essential inter-dependence of agriculture, industry and commerce; in the words of the report, 'it would be vain to hope that one could enjoy lasting prosperity without the others.'

"The broad fact upon which the report lays emphasis as a symptom of economic depression in agriculture is the relatively lower level of agricultural prices, as compared with industrial prices, which is shown by the index numbers of several countries. The result has been the diminution of the purchasing power of the agricultural population. Although not true of all countries, 'the documentation of the conference,' to use the words of the introduction to the final report, 'indicates that if agricultural prices are low and the agricultural communities in many countries in a state of depression, it is not because there has been any abnormal increase in the production of foodstuffs, but because the demand from certain manufacturing communities in Europe is inadequate. . . .'

". . . Practically all of the 50 countries taking part in the conference were interested in agriculture, but, not unnaturally, the outlook of the delegates from the various nations depended first of all on the national problem which confronted them, which differed very widely between one country and another. Nevertheless, bearing in mind what has been mentioned above, it will be seen that the report, in effect, indicates two main directions in which an agricultural revival must be sought. One lies in the improved demand which would be created by an expansion of industry and commerce, and although the main recommendations of the conference on the subject of trade barriers are contained in the section of the report dealing with commerce and not in that relating to agriculture, nevertheless the recommendations of the latter concerning the removal of all hindrances

to the free circulation of and trade in agricultural products, to the reduction of customs prohibitions both for industry and agriculture, and to the abolition of systems of export prohibitions and duties and of frequent changes in customs tariffs, are some indication of the importance which the agricultural committee attached to these matters.

"The other direction in which improvement is to be sought is in raising the standard of agricultural technique, and the majority of recommendations contained in the report are concerned with this subject. They relate to the extension of co-operation—particularly between producers' and consumers' organisations—to the improvement of credit facilities, to international co-operation in providing statistical information and in the development of systems of farm accounting, and also to the development of forestry and colonial agriculture. Not the least important is the recommendation relating to an international campaign to combat plant and animal diseases, in connection with which the International Institute of Agriculture in Rome are proposing to call a further conference. In addition to the above, the report calls attention to the importance of improvement in stock breeding, marketing and the standardisation of agricultural products."

Brick and Iron Settler's House at Chipoli.

[*The following notes and the accompanying illustration have kindly been supplied to us by Mr. J. M. Moubray.*—Ed.]

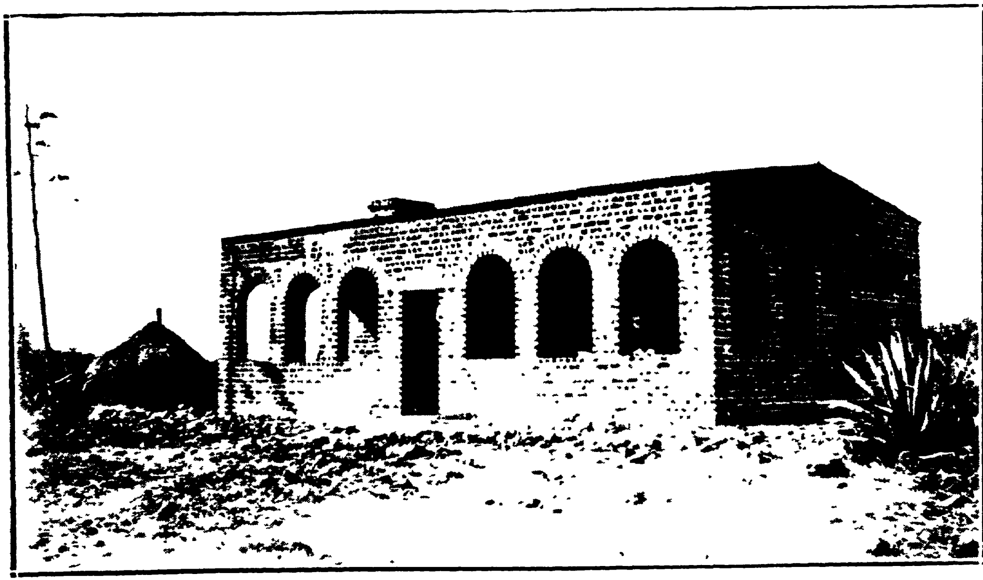
Roof: lean-to, centre wall. Walls 10 ft. to 12 ft. high. Rooms: Dining room, 18 ft. x 12 ft.; bedroom, 15 ft. x 12 ft. Verandah, 8 ft. Fireplace in dining room. Windows: double cottage casements, one at back and one at front of each room (through draught in hot weather). Back windows open inwards to allow of mosquito netting on outside. Mosquito netting all round outside of brick arches and mosquito door on to verandah. 20,000 bricks.

Roof: 42 sheets 10 ft. corrugated iron.
35 ft. ridging.
230 ft., 2 in. x 3 in.
8 pieces 10 ft. long, 4½ in. x 1½ in.
13 pieces 13 ft. long, 4½ in. x 1½ in.
21 pieces S X board, 6 ft. x 3 ft., for ceiling, nailed directly on to rafters. (This is a British product.)

Sixty feet of ceiling board cut into 1½-in. strips for ceiling. 100 ft. moulding for doors and windows. Three door frames—two panel doors and one mosquito door. Ten bags local cement for damp course and floors; the house is white ant proof.

House can be built in lime or good dagga. If lime, then 30 bags are required.

House built by native labour, supervised by settler. Cost of native labour, £10.



Settler's hut at Chipoli, Shamva

Government Farm, Gwebi.

SEEDS FOR SALE.

Salisbury White Maize	20/- per 100 lbs.
Kherson Oats	20/- ,, ,,
Kinvarra Oats	25/- ,, ,,
Ground Nuts (Spanish Bunch, unshelled)	17/6 per bag
Dolichos Beans	27/6 per 100 lbs.
White Stingless Velvet Beans	20/- ,, ,,
Linseed	6d. per lb.
Boer Manna	4d. ,,
Red Manna	4d. ,,
Sudan Grass	6d. ,,
Majorda Seed	1/- ,,
Sunflower Seed (Large Black)	15/- per 100 lbs.
Sweet Potato Slips	5/- per bag
Napier Fodder Roots	5/- ,,
Kikuyu	5/- ,,

Prices are f.o.r. Gwebi. Before sending cheques, intending purchasers are advised to ascertain that the seeds required are still available. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Salisbury.

Movements of New Settlers.

The following new settlers arrived in this Colony during the month of August, 1927:—

A. Forrester.—Arrived from Great Britain on 1st July, and joined H. B. Christian for a period of training.

E. Wharum.—Arrived from Great Britain on 8th July, and obtained employment with J. N. A. Scott, Gwelo.

D. Fitzgerald.—Arrived from Great Britain on 2nd August, and proceeded to F. H. Johnson, Cawdor, Salisbury, for a period of training.

N. C. Clay and J. du Preez.—Arrived from the Union on 3rd August, and proceeded to Tilbury Estate, Melsetter.

D. Thomson.—Arrived from Great Britain on 6th August, and obtained employment on the Romsley Estate, Inyazura.

W. J. Francis.—Arrived from Great Britain on 6th August, and is visiting friends.

Commander Stopford.—Arrived from Great Britain on 8th August.

Miss Dixon.—Arrived from the Union on 9th August on tour of inspection.

C. L. A. Hall.—Arrived from Great Britain on 10th August, and proceeded to D. Cunningham, Nyabira, for a period of training.

R. S. C. Cobbold.—Arrived from Great Britain on 10th August.

Mr. and Mrs. B. G. Thring.—Arrived from Great Britain on 10th August.

Mr. and Mrs. T. H. Tetley.—Arrived from Great Britain on 10th August, and proceeded to Gwebi Farm for a period of training.

Mr. and Mrs. H. la T. Boyd Moss.—Arrived from Great Britain on 12th August, and joined A. Tulloch, Penhalonga, for a period of training.

H. B. FitzHenry.—Arrived from Great Britain on 12th August, and joined R. J. Tarrant, Marandellas, for a period of training.

J. S. Brown.—Arrived from Great Britain on 15th August, and was accommodated by E. S. White, Concession, for a period of training.

J. du Pree.—Arrived from Great Britain on 15th August.

R. O. Carey.—Arrived from Great Britain on 21st August, and joined J. Dennis, Pendennis, Salisbury, for a period of training.

R. S. Wood.—Arrived from New Zealand on 24th August.

Major Hilden.—Arrived from Great Britain on 24th August on tour of inspection.

A. Jones.—Arrived from Great Britain on 28th August.

K. C. Donaldson.—Arrived from the Union on 30th August, and joined E. J. Dawson, Concession, for a period of training.

W. Baillie.—Arrived from Great Britain on 31st August.

C. C. Mollison.—Arrived from Great Britain on 31st August, and joined C. C. Tennant, Umvukwes, for a period of training.

R. M. R. Halsey.—Arrived from Great Britain on 12th August.

A. V. G. Trimmer.—Arrived from Great Britain on 15th September, and is with the Mazoe Tobacco Estates, Ltd.

Southern Rhodesia Veterinary Report.

July, 1927.

AFRICAN COAST FEVER.

BULAWAYO DISTRICT.—The mortality for the month under review shows a further decrease, being five, against eleven for June. Essexvale Estate, 1; Adams, 1; The Range, 3.

There is nothing to report for the other districts.

ANTHRAX.

One outbreak occurred amongst native cattle on Sandown North, Bulalima-Mangwe district; mortality, three. All in-contacts have been inoculated. One case occurred at the infected area Nthabazinduna Reserve, Bubi district.

QUARTER EVIL.

Mortality has been reported from most districts.

HORSE-SICKNESS.

Bulalima-Mangwe, 1; Mrewa, 1.

TRYPANOSOMIASIS.

Seven cases reported from the Hartley district, and on investigation it was found that there had been a mortality of 44 in the Dett Valley, Nyamandhlovu district, during the past seven months.

TUBERCULOSIS.

One hundred and two cattle were tested with tuberculin on importation, with negative results.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 82; cows, 159; heifers, 60; calves, 18; horses, 46; mules, 25; donkeys, 103; sheep, 998; goats, 511.

EXPORTATIONS (CATTLE).

To Union of South Africa:—For consumption in Union, 2,569; for overseas export, 1,850. To Belgian Congo:—For slaughter purposes, 1,348; for breeding, 50. To Portuguese East Africa:—For slaughter purposes, 141.

EXPORTATIONS (MISCELLANEOUS).

To Northern Rhodesia:—Goats, 95; sheep, 218. To Belgian Congo:—Pigs, 299; sheep, 70. To Union of South Africa:—Pigs, 33.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

AUGUST, 1927.

Pressure.—The barometric pressure was uniformly below normal over the country, varying from 0.030 below normal at Melsetter to 0.004 above normal at Umtali. The daily pressure at Salisbury showed marked similarity with that of August, 1924. The pressure was extremely low on the 27th, being 0.145 in. below normal.

Temperature.—Temperatures during the month were low. Mean day temperatures varied from 2.1° F. above normal at Matopos to 5.4° F. below normal at Sipolilo. The mean night temperatures varied from 1.2° F. above normal at Salisbury to 3.8° F. below normal at Tuli. Mean temperatures varied from normal at Enkeldoorn, Essexvale, Shamva, Gwelo and Salisbury to 3.2° F. below normal at Sipolilo. Occasional frosts were recorded during the month, as recorded in the Plumtree report.

The following weather notes have been submitted:—

Zone B.—

Plumtree.—

Save for the unexpected and severe fall in temperature experienced on the night of the 26th, no unusual meteorological conditions prevailed. That evening, however, the wind changed completely round from north-north-west to south-south-east, and the temperature rapidly fell, reaching a minimum of 31°—nearly 7° lower than the previous lowest this year. The previous afternoon a shade temperature of 82° F. was recorded, which, but for the previous day, had only been once exceeded since 25th April. Ice was found in many exposed places in the neighbourhood.

The meagre rains of last season are now causing a severe shortage, and early rains are eagerly desired. Signs are not

wanting that these hopes will materialise, for many snakes have been seen, and towards the end of the month especially the wind showed a distinct tendency for the north-west, while the temperature was rising day by day.

In the surrounding district young grass has appeared with the warmer weather, and cattle are looking quite well, despite the severity of the drought, save in parts of the reserve, where water is very scarce.

A peculiar feature is the increase in water about mid-August. Local farmers ascribe it to the incidence of frosts at this time. Is it merely the coincidence of the frosts with the replenishment of underground reservoirs by the water from summer rains by percolation? This is surely a more satisfactory explanation.

Holly's Hope.—

The conditions are much worse than last month. Grazing, especially in the Shashani native reserve, is very bad; in fact, there is no grass at all to speak of, and the cattle are feeding on the bush and dry leaves which have fallen. Deaths from poverty (also quarter evil) are frequent, and if no early rains fall the losses will be very heavy, and even after rains fall the cattle will continue to die, as they are too poor and cannot "pick up" their strength on the young green grass. Water in the rivers is holding out well. Days are becoming warmer, and that piercing cold during the nights has disappeared. There are signs of spring too, and some bush trees are already showing up green. This will assist cattle to hold out longer; but in any case it is not the same as a good feed of grass. So far there have been no grass fires round this part; should one break out, it will not travel far, as there is nothing to burn.

Zone C.—

Gatooma.—

The weather was very mild for the first three weeks of the month. During the fourth week it was very much warmer and on some days sultry.

Salisbury.—

The pressure during the month was below the average. A low made its appearance on the 26th, following upon two highs. The tail of the high at its maximum at the end of

last month brought rain, and hail was observed at 1.30 p.m. on the 1st. The middle of the month was characterised by dust storms. After the 22nd the weather became typified by cool mornings, with an oppressive sultry heat making itself apparent towards noon and afternoon, with manifestations of nimbus clouds. The numerous veld fires towards the end of the month were responsible for a general haze suffusing earth and sky to such an extent that a survey on the 28th had to be suspended.

Zone D.—

Mazoe Dam.—

Beyond a slight shower on 1st (0.03) and another on 27th (0.09), there was nothing particular to note about the weather during August.

The temperature rose on precisely the same date as last year (25th) to 82°, and again on 26th to 85°. I mention this as I have heard people say what a sudden change it was, but I think they always say that.

Shelling is going on in the neighbourhood and there is still some reaping to do. Labour has been—and still is—very short.

Zone E.—

Riverdene North.—

The first half of this month was cold, with frosts generally experienced in the night; but in the latter part, milder weather ensued.

Not much moisture has fallen in the shape of dew, and only on one day—the 11th—has there been any precipitation, when .03 in. drizzle fell.

The winds have been very variable, with considerably more coming from the west than is usual; they have generally been moderate to fresh during the day, with a dying down towards sundown. On the 24th and 25th there was half a gale from the north-west during the daylight period, with every indication of a thunderstorm and rain and a big jump in temperature—91°—but nothing eventuated.

The Popotekwe River, in spite of the poor wet season, is still running a fair stream. Cattle appear to be keeping their condition well, although this winter has been very severe

and very little grass around. Trees are now starting their spring verdure, and so far no veld fires have been in evidence.

Victoria.—

The month has been fine, and warmer weather set in during the latter half. No frost was registered; winds have been strong and variable. The maximum temperature on 26th inst. was 90° in the shade. A strong cool breeze arose during the night of the 26th, followed by a sudden drop in the temperature. No rainfall is recorded.

Umtali.—

Up to 11th August: lovely and bright. 12th to 13th: cold drizzle and intermittent showers. 14th to 17th: Cold winds, with bright days. 28th to 31st: Hot, hazy, with rain clouds working up from north-west.

RAINFALL.

The following stations have reported rain during the month:—

Zone C.—

Charter—	
Enkeldoorn	.02
Hartley—	
Carnock	.05
Currandooley	.50
Lomagundi—	
Citrus Estate	.10
Impingi	.42
Mica Field	.03
Sinoia	.11
Sipolilo	.69
Umvukwe Ranch	.38
Salisbury—	
Ballineety	.25
Bromley	.14
Cleveland Dam	.07
Salisbury Agric. Dept.	.04
Sebastopol	.08
Tobacco Experiment Station	.06

Zone D.—

Darwin—	
Mount Darwin	.08
Rusambo	.06
Inyanga—	
Juliasdale	.02
Marandellas—	
Fault Farm	.15
Mazoe—	
Bellevue	.20
Citrus Estate	.45
Craigengower	.51
Dandejena	.09
Donje	.53
Frogmore	.45
Glen Divis	.08
Glen Grey	.08
Pearson Settlement	.16
Shamva Mine	.13
Sunnyside	.07
Teign	.57
Visa	.55
Woodlands	.03
Zombi	.14
Mrewa—	
Nyaderi Mission	.01
Mtoko—	
Makaha	.06
Mtoko N.C.	.34
Salisbury—	
Arcturus	.13
Chindamora Reserve	.04
Hatcliffe	.03
Kilmuir	.02
Meadows	.03
Pendennis	.14
Vainona	.20

Zone E.—

Bikita—

Angus Ranch	.02
Bikita	.48

Gutu—

Glenary	.07

Marandellas—

Benongwe	.04
Macheke	.15

Melsetter—

Brackenbury	.11
New Year's Gift	.05

Ndanga—

Zaka	.08

Selukwe—

Impali Source	.29

Umtali—

Alicevale	.07
Embeza	.22
Fern Valley	.06
Park Farm	.14
St. Augustine's Mission	.08
Umtali Gaol	.09

Victoria—

Brucehame	.02
Cheveden	.11
Riverdene North	.03

Zone F.—

Melsetter—

Chikore	.51
Lettie Swan	.27
Melsetter	.25
Mount Selinda	.79
Vermont	.38

Farming Calendar.

October.

BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth. the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

CROPS.

With the advent of summer heat plant growth is only limited by conditions of moisture. It is best, however, on unirrigated lands to delay planting until steady rains can be relied on, and in the meantime to utilise any opportunity that offers to get the soil into as good a condition of tilth as possible. Vleis and low-lying lands that later on become boggy may, however, be planted to maize or pumpkins.

Ploughing of old lands may continue, and if the clods are not too hard, the plough should immediately be followed by the disc or spike harrow. Lands ploughed earlier in the season can be cross-ploughed or disc-harrowed or rolled to bring them to a good condition for seeding.

Most winter cereal crops will be ripe and ready for harvest, and the stubble should be ploughed under as soon after reaping is finished as possible.

Owing to the difficulty of keeping the seed, it may be necessary to plant main crop potatoes this month, but if planting can be postponed until later, it is to be preferred.

The overhauling of all implements required for use on summer crops should receive attention.

DAIRYING.

Cows in milk should now, before the rains, be getting a full ration of succulents and concentrates. It is a wise practice to keep them in good condition, so that when the grass comes after the first rains they may make

full use of it for milk production, and not be compelled to draw on their body tissue to keep up the supply. The same applies to dry cows which will calve in November or December. If they are allowed to fall into poor condition, the calves are usually weedy, and the mi'k is poor both in quantity and quality. To get the most profit out of the early grass it is essential that a ration of concentrates be continued to be fed. The weather is now beginning to become warm, and every precaution should be taken to keep the cream and washing water for butter making as cool as possible. This can be best achieved by means of a home-made cooler or safe, over which wet cloths are hung. If this is exposed to the wind the temperature of its contents can be considerably reduced and good butter made. It is always essential to wash the butter whilst in a granular stage with the coolest water obtainable. Canvas water coolers are difficult to beat for obtaining the requisite supply of cold water.

The shelves of the cheese room should be scrubbed with plenty of hot water and soda, and for the last rinsing a very weak solution of formalin should be employed. This will kill all mites and mould spores. Should cheese-making be begun this month it is essential that the milk should be tested for butter fat. Most milk in Rhodesia at this time of the year is deficient in butter fat, because the cows have been allowed to fall off in condition. If the milk tests below 3.3 per cent. butter fat it is very difficult to make satisfactory cheese. Cheese made from milk of a low fat content invariably becomes hard, dry and flavourless in a very short time. Should the milk be deficient, it is good practice to defer cheese-making operations until later in the season.

DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the undesirable ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize lands, tomato and Cape gooseberries near the lands; a clearing of some depth is advisable, which must be regularly weeded. If poisoned bait is put down, it has been found that a covering of sacking or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of 1½ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the mixture not reacting upon

one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by very careful spraying with the combined "Lime-Sulphur-Nicotine" spray (for details see "Journal." Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta"), and the Chief Entomologist should be immediately informed should this pest be found.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 10 gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is more essential than at first thought, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes shou'd be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

FORESTRY.

Prick out into tins or trays any seedlings that are ready. Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots. Further sowings of Eucalypt seed to be taken in hand. If conditions are favourable, cross plough and harrow land broken up in early autumn.

POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have shade during the hottest part of the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls; they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. Part of the floor of the duck house should be raised a few inches, thus ensuring a dry bed.

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further afield they go, the better grown birds they become, and less is the expense of feeding. See also that their roosting quarters are water-tight before the rains commence.

STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for

the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
16.9.27.	Government Notice No. 513 reduces the guard area in the Charter native district to one farm deep round the infected area.
	NOXIOUS WEED ACT, 1926.
16.9.27.	The introduction into Southern Rhodesia is prohibited of the seeds, fruits, stems, roots or any portions of the following plants belonging to the genus Opuntia, namely, prickly pear (Opuntia tuna, Opuntia ficus-indica, Opuntia monocantha). Seeds of the following noxious weeds may not be introduced into Southern Rhodesia:—Burweed (Xanthium spinosum), Mexican poppy (Argemone mexicana), dodder (Cuscuta), all species.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	October.	Nov.
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	8	12
Banket Junction	Banket Hotel	F. Potts	7	4
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	27	24
Bindura	Bindura Farmers' Hall	W. E. Fricker	8	12
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	5	2
Bubi	Queen's Mine	E. C. Gaudin	11	8
Chakari	Various farms	L. T. Tracey	20	17
Chatsworth	Makowries Farm	A. W. White	1	5
Daisyfield	Daisyfield (October), Somabula (Nov.)	L. E. Edwards	15	12
Darwendale—Trelawney	Various farms	B. Theck	12	9
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	8	12
Enterprise	Farmers' Hall	John Johnstone	3	7
Essexvale	Essexvale	C. Geneve	16	20
Felixburg—Gutu	Blythe (October), Fairburn (November)	C. L. Burrows	8	12
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	4	1
Gadzema	Gadzema	G. M. Leahy	9	13
Gatooma	Speck's Hotel	C. M. Davenport	15	19
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	8	12
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	3	7
Greystone	Quarrie Farm	P. J. van der Walt	...	12
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	13	10
Inyazura	Inyazura	Major Tulloch	7	4
Lalapansi	Lalapansi	Edmund Chapman	8	12
Lomagundi	Sinoia	F. W. Robertson	14	...
Lomagundi West	Various farms	E. Morton	9	6
Macheke	Macheke	M. J. Palmer	...	12
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	2	6
Makwiro	Makwiro	F. H. Howard	21	18
Makoni	Rusape	—. Munch	8	12

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	7	4
Marandellas, Southern	Various farms	D. J. Gale	5	2
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	14	11
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	13	10
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	15	19
Mazoe (Concession)	Concession Hotel	A. W. Laurie	14	11
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	12	9
Melsetter	Court House, Melsetter	Dr. Rose	13	10
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	12	9
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	29	26
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	7	4
Nyamandhlovu	Nyamandhlovu	R. D. McLean	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	1	5
Poorte Valley	Various places	D. Wilson	15	19
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	15	19
Salisbury South	Various farms	P. Linton	26	30
Selukwe	The Hotel, Selukwe	W. T. Simpson	7	4
Shamva	Shamva Hotel	E. Butler	20	17
Two Rivers Farming Association	Various farms	W. L. Parsons	8	12
Umboe (Branch of Lomagundi F.A.)	Various farms—Dingley Dell (Sept.)	A. J. Hawkes		12
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	8	12
Umtali	Drill Hall, Umtali	A. Howat	6	3
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	14	11
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	12	9
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	...	...	112	..	...	884
March ...	135	1,837	..	2,375	...	...	50	34	...	4,431
April ...	106	2,574	...	1,440	...	...	28	...	...	4,148
May ...	205	3,458	...	1,299	..	...	118	...	...	5,080
June ...	1,249	6,280	..	1,484	...	...	100	...	...	9,113
July ...	2,569	1,850	..	1,348	50	...	141	...	...	5,958
August ...	955	239	...	2,623		...	284	...	...	4,101
September ...										
October ...										
November ...										
December ...										

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Rhodesian Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Yellow Woods Rita	Shorthorn	4,413.50	...	224	J. Bazeley, Heany Junc.
Yellow Woods Rachel	do	3,439.00	...	203	do do
Zazkins ...	do	5,478.50	239.98	407	G. Cooper, Essexvale
Key ...	do	4,010.20	158.04	374	do do
Mooi ...	do	4,468.70	169.64	380	do do
Rosey ...	do	3,879.60	126.22	326	do do
Betta ...	do	2,858.80	124.39	218	do do
Flora ...	do	3,204.10	104.46	255	do do
Pepper ...	do	3,464.50	168.43	219	do do
Bella ...	do	2,788.80	96.20	216	do do
Boontje of Kaalplaats	Friesland	3,600.00	...	120	A. T. Holland, Chatsworth
Mary ...	do	1,027.00	...	30	do do
Cedara Dream...	Shorthorn	2,694.62	...	90	Roberts & Letts, Heany J.
Kendal Valley...	do	2,161.62	...	90	do do
Buttercup ...	Friesland	6,2[illegible]2.00	213.90	287	R. R. Sharp, Redbank
Anemone ...	do	5,748.00	208.00	315	do do
Zoe ...	do	6,181.00	209.70	280	do do
Pam ...	do	6,662.00	164.70	280	do do
Katisha ...	do	4,851.00	164.80	273	do do
Primrose ...	do	4,375.00	185.50	245	do do
Lady Jane ...	do	5,187 00	201.70	267	do do
Phœbe ...	do	1,158.00	38.70	60	do do
Buttercup ...	do	906.00	29.00	30	do do
Palm Tree Lady	do	9,745.00	418.89	504	J. S. Struthers, Sinoia
,, Eileen	do	8,651.00	435.25	469	do do
,, Beatrice	do	9,025 00	411 66	469	do do
,, Violet	do	10,032.00	428.09	455	do do
,, Pearl	do	4,818.00	252.74	266	do do
,, Laura	do	7,233.00	305.81	427	do do
Cavers Waterpas	do	5,330.00	200.38	266	do do
Palm Tree Molly	do	7,576.00	369.49	427	do do
,, Rosey	do	6,152.00	258.35	406	do do
,, Noonie	do	4,711.00	203.32	280	do do
Cavers Waterpas	do	2,130.00	68.77	98	do do
Palm Tree Pearl	do	2,278.00	115.18	91	do do
Melrose Frederika	do	7,636.00	283.67	300	W. R. Waller, Salisbury
Wolseley Josephine	do	6,815.00	252.55	300	do do
Dunoran Nona	do	8,223.50	270 31	240	do do
,, Pearl	do	9,771.75	325.10	300	do do
Herbert's Hope Iris	do	5,012.00	177.87	240	do do
Harlen's Dainty	do	9,653 50	340.90	300	do do
Bodlonfa Elsina	do	9,527.25	345.34	300	do do
Harlen's Quest	do	7,020.75	254.10	300	do do

RHODESIAN MILK RECORDS (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.	
Harlen's Query	Friesland	7,867.00	285.95	240	W. R. Waller, Salisbury	
Wolseley R. Albert	do	7,199.50	256.93	240	do	do
Ogden Hall Alberta	do	1,670.50	58.45	30	do	do
Bluff Hill Felicity	do	1,688.50	57.49	60	do	do
Dunoran Nona	do	1,263.50	42.74	30	do	do
Wolseley Artina	do	3,145.00	...	180	F. Zeender, Insiza	
Wolseley Vera II.	do	3,483.00	...	150	do	do
D.G. Bessie Burger	do	8,968.00	265.09	273	Gwebi Experiment Farm	
,, Selma	do	10,143.50	299 04	326	do	do
,, Laura	do	2,847.75	71.17	109	do	do
,, de Hoop	do	8,561.00	266.82	284	do	do
,, de Hoek	do	4,853.00	116.68	243	do	do
,, Stienser	do	7,778.25	259.82	270	do	do
,, Roza	do	6,974.50	196.49	371	do	do
,, Froukje	do	10,055.00	294 13	340	do	do
Palm Tree Allie	do	8,879.75	275 92	302	do	do
Janie ...	Grade Friesland	9,381.50	356 64	448	do	do
Antbloem ...	do	5,094 00	162.54	245	do	do
Bertha ...	do	5,948.50	210.33	269	do	do
Dorothea ...	do	3,632.00	121.34	139	do	do
Hannah ...	do	7,452.50	220.72	203	do	do
Elsie ...	do	11,757.50	406 63	436	do	do
Clara ...	do	3,025.25	88.48	84	do	do
Katie ..	do	4,617.00	159 57	199	do	do
Fanny ...	do	5,690.00	192.25	203	do	do
Kleinbloem ...	do	3,605.00	134 70	143	do	do
Mooibloem ...	do	3,730.00	148.41	203	do	do
Gladys ...	do	8,180.25	253.87	384	do	do
Isa ...	do	9,664.75	307 30	356	do	do
Lucy ...	do	4,000.25	111.40	145	do	do
Waterbloem ...	do	10,294.75	358.16	491	do	do

Departmental Bulletins.

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Maize Grading Regulations.

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No. 655. Southern Rhodesia Seventh Egg-Laying Test—1st March, 1926, to 30th January, 1927, by H. G. Wheeldon.

The following pamphlets can be obtained from the Poultry Expert upon application:—

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Cold Weather: Treatment of Fowls in, by A. Little, Poultry Expert.
Tuberculosis, by A. Little, Poultry Expert.
Diseases of the Liver, by A. Little, Poultry Expert.
Prevention of Disease among Poultry, by A. Little, Poultry Expert.
Vices: Causes, Prevention and Cure, by A. Little, Poultry Expert.
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Autopsies, by A. Little, Poultry Expert.
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Preparing Birds for Show, by A. Little, Poultry Expert.
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The Fowl Tick (Argas persicus), by A. Little, Poultry Expert.
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Artificial Incubation, Brooding and Rearing of Chickens, by H. G. Wheeldon, Assistant Poultry Expert.
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MISCELLANEOUS.

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Labour-Saving Machinery.—We publish elsewhere in this issue of the Journal a short article on the above-mentioned subject. The author prefers to write under a *nom-de-plume*, but we can assure our readers that he is well fitted to deal with this important subject and has put to practical test the various devices to which he refers. His point in regard to the absence of detail in the discussions which take place at farmers' meetings is one we can corroborate in so far as the reports which appear in the Press are concerned. It is of little use stating broadly that labour-saving machinery or devices are necessary unless an indication is given as to where economy is to be effected. We

invite correspondence on this subject, and we particularly ask readers to furnish us with details and, if possible, with a sketch of any device which has been proved to achieve the purpose desired. An interchange of ideas would, we believe, be most valuable, and we trust that readers will make use of our columns for this purpose.

We feel sure that the few notes which our correspondent has sent us will be read with interest, and it may be that what is written may suggest to others ways and means whereby labour can be economised. The last paragraph of "Labour Saver's" article is well worth thinking over.

Rhodesia at Edinburgh.—As will be seen from the photograph reproduced on the opposite page, this Colony was represented at the Edinburgh Empire Exhibition, held on 27th July to 6th August in the Waverley Market, Princes Street. Southern Rhodesia occupied a separate section of the Department of Overseas Trade stand, the area allotted being 160 square feet. An attractive display of agricultural produce was made, including tobacco and oranges. Some mineral specimens were used as decorations, although, properly speaking, the display was limited to foodstuffs and tobacco. Photographs, maps, etc., were displayed and literature distributed, although, judging from the illustration, the photographs were not a very strong feature.

We are informed that the exhibition was attended by about 40,000 people, who found the stands of the Empire Marketing Board the chief attraction. There were numerous enquiries for tobacco and a few for mica, chrome and asbestos. Oranges were the subject of much comment, and several shops had supplies of Rhodesian-grown oranges exhibited in their windows for sale. The Southern Rhodesia exhibition created a very good impression on the general public, and will, it is thought, do much to encourage the right kind of settler to come to the Colony.

Afforestation.—The staff of the forest service of the Colony has been strengthened by the appointment of Mr.

The Rhodesian stall at the Edinburgh Empire Exhibition

T. L. Wilkinson as an assistant to the Forest Officer. Mr. Wilkinson, on completion of his post graduate course at Oxford, was offered an appointment by this Government, which he accepted, and on the 7th October reported for duty at Salisbury.

Mr. Wilkinson was educated at St. Peter's School Collegiate, Adelaide, where he matriculated to study forestry at the Adelaide University. Before proceeding there he took a practical course in forestry in the field, carrying out actual labour operations. At the University he graduated in forestry, at the same time reading for a B.Sc. degree in geology and botany. During his course, and for a period afterwards, he availed himself of opportunities of visiting and assisting in forest operations in the various States of the Commonwealth of Australia.

Upon leaving Australia, Mr. Wilkinson travelled abroad to study conditions in other countries, and completed his training with organised tours in Europe with Professor Troup and studying under him at the Imperial Forestry Institute, Oxford, where he took a post graduate course in silviculture, management and economics. During his studies and travels he has made a special study of the genus eucalyptus.

A Ministerial Change.—Farmers will, we are sure, wish us to extend a cordial welcome to Lieut.-Colonel O. C. du Port, D.S.O., who has been appointed Minister of Agriculture and Lands *vice* Mr. J. W. Downie. Lieut.-Colonel du Port is too well known to need any introduction from us; suffice it to say that his practical knowledge of farming conditions in this Colony will stand him in good stead in the high office to which he has been called. Agriculture in Southern Rhodesia has emerged from its swaddling clothes and stands on the threshold of vigorous development. It has suffered all the ailments associated with rapid growth, but now stands four square to the world, confident in its ability to make good. There is, however, much to be done. Our products are now being sold in the world's markets and meeting the keen competition of old established countries. We have in a large measure overcome the difficulties of production; it now remains for us to see that we reap the full

reward of our labours. The paramount necessity of research work in regard to agriculture is recognised throughout the world. Particularly is it essential in a young country such as ours. There is need for wise direction and the vision to plan for the future. The new Minister brings to the study of these problems a well-trained and disciplined mind, and we feel sure that he will have the full support and confidence of all associated with the agricultural industry in this Colony.

In welcoming Lieut.-Colonel du Port we have to bid adieu to Mr. J. W. Downie, who has been Minister of Agriculture and Lands for the past two and a half years, and who now takes up the portfolio of Mines and Public Works. The ability and energy which have characterised Mr. Downie's work during his term of office have left their impress upon the industry and will be of lasting benefit to the community in general.

Imports and Local Production.—It is surprising to observe the extent to which we are still dependent upon outside sources of supply for certain necessities of life, notwithstanding the material progress which the agricultural industry has made during the past few years. For instance, during the year 1926 we imported into this Colony wheat, flour and meal to the value of £112,022, the greater portion of which was brought from overseas. It may be that the price paid for wheat locally is not sufficient to induce farmers to grow the crop, but it is significant that it can be sold, presumably at a profit, at this distance. We spent £10,722 on imported bacon and £3,327 on hams, fats and lards which should be produced in the Colony. Potatoes cost us £13,739, cheese £9,231 and eggs £3,653. We imported common laundry soap to the value of £38,448 and toilet soap to the value of £8,782. There seems to be no reason why our requirements of soap should not be met locally, for the raw material in the form of ground nuts can be produced in almost unlimited quantities. Mutton cost us £13,137, coffee £20,535 and imported deciduous fruits £14,412, and represent money which should go into the pockets of our farmers. It is well that we should take note of the fact that our importations of wood, cane, wicker and

manufactures thereof during last year amounted to £213,973. Writing on this subject in the *Rhodesia Agricultural Journal* a few years ago, the Assistant Forest Officer made the statement that all of this imported timber can and should be produced in the country.

It is obvious that opportunities lie at our doors of which advantage is not being taken. It is a reproach that so much money which might be retained in the Colony is spent elsewhere, and it behoves us all to examine the position carefully to see in what manner we can in a greater measure supply our own requirements of the various items mentioned.

Empire Butter and Cheese.—In their annual review of the imported dairy produce trade for the year 1926-27, Messrs. W. Weddel & Co., Ltd., state that there was no scarcity of butter on the British market at any time during the year. Indeed, supplies of most descriptions were more plentiful than ever. Owing to the drought in Australia and the falling off in Canadian shipments, the quantity received from Empire sources was again smaller; this deficiency was more than made good by augmented shipments from most of the foreign sources of supply, especially Denmark, Holland and the Baltic countries. Out of the 261,597 tons of butter imported into Great Britain, only 34.3 per cent. came from British sources, as compared with 39 per cent. in the preceding year. Importations of cheese were practically equal in volume to those in the preceding year, but here again heavier shipments from foreign sources were called upon to fill the gap caused by reduced Empire supplies. While the great bulk of the supplies of cheese from overseas is still of British origin, the preponderance is not so great as it was some years ago, as several of the Continental sources of supply appear to be making efforts to regain the position they held before the war on the British market.

Unfortunately, nothing of a cheerful nature can be said about the course of market prices for either butter or cheese during the past twelve months. The averages for the year of 178s. 3d. per cwt. for Danish butter, 163s. 6d. for New Zealand, 160s. 9d. for Australian, 157s. 6d. for Argentine and 144s. 11d. for Siberian are sufficiently eloquent, reveal-

ing as they do a drop of 12s. to 24s. per cwt. from the average level of the preceding year. Proof of the unpopularity of New Zealand butter is only too clearly shown in its average price for the year, which was 24s. 2d. per cwt. lower than in the preceding year, showing that New Zealand butter suffered more severely than any other description. Cheese prices were maintained at a low but fairly steady level during the first five months of the year, but thereafter, so far as New Zealand cheese was concerned, moved in accordance with butter quotations. The averages for the year—viz., 93s. 6d. for Canadian and 87s. 6d. for New Zealand—were the lowest since 1915.

Cotton.—From what can be gathered, there is likely to be a large acreage planted with cotton in the Union of South Africa this season, the attraction no doubt being the enhanced prices prevailing for lint. In Rhodesia, cotton will probably be planted as a rotational crop with maize, the excellent results obtained by previous plantings amply justifying such a course. In this farmers are acting wisely, for with the experience of the last few years behind them it would be risky to plant cotton on any very considerable scale. That cotton can be grown successfully in certain parts of the Colony has been fully proved, but operations must of necessity be restricted until such time as suitable seed is available. There is every reason for believing that before long the plant breeders at Gatooma will succeed in propagating a variety which will meet our requirements, and when that time does arrive cotton will no doubt occupy a prominent place in the list of crops grown in this Colony. A limited quantity of seed obtained from the Union of South Africa is being distributed to farmers this season, but, as Mr. Cameron pointed out in the September issue of the Journal, no guarantee can be given that it is resistant to jassid attack.

It would appear that the acreage under cotton in the United States of America has been curtailed this season, the decrease amounting to as much as 12.4 per cent. as compared with last year's acreage. Boll weevil is said to be doing considerable damage to the plants, and it is believed to be

improbable that the yield per acre will be as great as it was last season. The Indian crop is also reported to be doing badly. These factors, added to the knowledge that the consumption of cotton during the past twelve months has been abnormally high, are apparently responsible for the upward trend in prices. We will not attempt to forecast what the position will be in a few months' time, for conditions may alter. There is a distinct feeling of nervousness among buyers that supplies may be short next year, and it is possible that cotton may return a good profit to the successful grower. However, we advise farmers in this Colony to plant only limited acreages of this crop until such time as they are advised that sufficient seed of a jassid-resistant variety is available for general distribution.

Farming in Uganda.—We have received the annual report of the Department of Agriculture of the Uganda Protectorate for the year ended 31st December, 1926, from which we observe that the value of domestic produce exported amounted to £3,597,437, a decrease of £1,499,437 compared with the previous year. The decrease is attributed mainly to the fall in cotton prices. Cotton accounted for 84.83 per cent. of the exports, the value being £3,051,991. Coffee exported was valued at £147,884, rubber at £135,619 and ground nuts at £6,026. It is of interest to note that, as a result of the excellent net-work of roads in the cotton-producing areas, large numbers of light motor lorries were in service and that their use is extending. About half of the cotton grown in Uganda is sent direct to Liverpool and the other half to Bombay and Japan.

Returns received from European plantations show that approximately 12,587 acres are under cultivation with *Coffea arabica* and 1,933 acres with *Coffea robusta.* The acreage under the former is declining, except in those parts of the Protectorate which are climatically suited to this type of coffee. The year's crop was disappointing, and abortion of coffee flower buds in many areas was a cause of loss. It is found that at an elevation of about 4,000 feet, with a humid climate and a rich soil, *C. robusta* thrives exceedingly well and gives a high yield per acre. The acreage under *robusta* is rapidly increasing.

Ground nuts show an increase of 339 tons in quantity and £4,890 in value by comparison with the previous year. Although this crop is grown on a considerable scale, cotton is the native's main money crop, and with the good prices realised for this, ground nuts are largely consumed locally.

Large quantities of chillies are grown in Uganda, but during the year the market has been depressed and exports amounted to 62 tons, compared with 113 tons in 1925. Exports of this crop reached their highest level in 1923 and 1924, when 911 and 1,068 tons respectively were exported. In 1923 chillies were valued at over £64 a ton, whilst in 1926 the price was just over £27 a ton.

Tea cultivation is promising and some extension of acreage is reported. The local market absorbs all the present output and the demand for Uganda tea is good.

Serious work in connection with tobacco growing was begun this year under the guidance of an officer of the Department, who visited Nyasaland for the purpose of studying the crop.

Attached to the report of the Director of Agriculture are the reports of the various technical officers, numbering nine in all, the whole making a valuable and interesting record of the year's work.

The Scrub Bull in Australia.—The Department of Agriculture, Victoria, have been broadcasting some very sound advice to farmers on the subject of scrub bulls. The average yield of butter fat per cow in Victoria is estimated to be 160 lbs., so that the probability is that many herds produce very little over 100 lbs. per cow. In the Government herd tests for pure-bred cows in 1926, 62 cows yielded over 500 lbs. of butter fat each in nine months, two of them produced over 700 lbs. each, and six gave over 600 lbs. each. Taking the average price of butter fat at 1s. 6d. per lb., the average normal cow yielding 160 lbs. earns for her owner £12 per year. A cow producing 800 lbs. of butter fat returns £60, and one giving 700 lbs. of butter fat, £50 per year. On the one hand the low yield is the result of careless haphazard methods of breeding with low-grade cows and a scrub bull,

while on the other hand a high standard is reached by careful selection, testing and breeding along defined lines. The pure-bred cow of to-day is the result of many years of patient study and reflection, and has been evolved from an animal that gave sufficient milk to feed her calf for a few months only.

In subsequent remarks it is stated that the tendency to revert or throw back to the qualities of some ancestor is very marked when mongrel and cross-bred sires are used. Breeders are continually striving to defeat this tendency to variation and reversion, while seeking to fix certain desirable characteristics. The longer any breed has been kept pure, the surer one can be that the characteristics of that breed will be transmitted to their offspring.

"It is a matter of great importance to every farmer that his heifers shall be superior to their mothers; but if he is using a scrub bull, from 80 to 90 per cent. of the resulting progeny will be inferior to their dams. There is only one direction in which a mongrel bull will help a farmer, and that is backwards. The low yield of dairy cows in the State of Victoria is attributed to the use of scrub bulls, a practice which is estimated to mean a loss of three millions sterling annually to dairy farmers. The bull's qualities impress themselves on a herd much more quickly than farmers realise. Every calf born gets 50 per cent. of its blood from the sire. The average period of usefulness of a dairy cow is reckoned as only from five to six years. There is little use testing and culling if a scrub bull is used; the good done in one generation will be undone in the next.

"Again, heifers sired by a bull of good milking strain will be an even line and of good quality, and will bring in the sale yard at least £2 more than the progeny of a scrub bull. Even if calves are to be sold for veal, it pays better to keep a pure-bred bull, as his calves are of better shape and weigh heavier than those sired by a scrub animal.

"Farmers wishing to improve their herds are advised, in short, to get a good bull and then to improve their herd by testing and culling."

The dairying industry in Victoria is worth about ten and a half millions sterling annually. The Department of Agriculture hope to make it worth twenty millions in a few

years' time, if only they can succeed in eliminating the scrub bull. In this connection they cite the case of Ireland and the legislation of recent years, which makes the registration of bulls compulsory. Some of the States in Australia are said to be moving in the same direction, and it is hoped that Victoria will follow their example.

The Feeding Value of White and Yellow Maize.—A good deal of research work has in recent years been carried out in the United States of America with the object of determining the feeding value of white and yellow maize, and we have on various occasions referred to the subject in this Journal. It has been known for some time that white maize is deficient in vitamin A, but to what extent this deficiency adversely affects the health of animals has not been definitely ascertained. We have received a bulletin from the Agricultural Experiment Station of the University of Illinois which has a further bearing on this matter. It records the results of an experiment undertaken with two general purposes in view: first, to compare the feeding value of white and yellow maize for pigs under various conditions; and second, to investigate the relative vitamin requirements of pigs for growth and reproduction. It was desired also to obtain some information concerning supplements for white maize rations that would adequately take care of the known deficiency of this cereal in vitamins. The conclusions arrived at are as follows:—

"White maize is not so satisfactory as yellow maize for growing and fattening pigs under restricted dry-lot conditions such as prevail on most maize belt farms in the winter, gains and health of pigs considered. This lower feeding value of white maize apparently is due to its deficiency in vitamin A.

"Young pigs are much more quickly affected by white maize rations containing no source of vitamin A than are old pigs, evidences of malnutrition developing much earlier in the young pigs. If pigs farrowed from sows that have been kept on such white maize rations during gestation are put on the same rations at weaning, very little if any growth will be obtained. On the other hand, if pigs are raised on

normal rations containing an adequate supply of vitamin A, they may store enough of this vitamin in their bodies to carry them through a gain of 100 to 125 lbs. on white maize rations just as economically as if they were fed yellow maize. Eventually, however, malnutrition, due to lack of vitamin A, will develop.

"Brood sows raised upon well-balanced rations may withstand the ill effects resulting from the deficiency of vitamin A in white corn rations for two gestation and lactation periods, though eventually their fertility is impaired. Furthermore, pigs farrowed in the first two litters on white maize feeding may grow as rapidly during the suckling period as other pigs farrowed from sows subsisting upon yellow maize rations. Evidently enough vitamin A is stored in the sow during a protracted period of adequate feeding to supply the requirements of two litters of pigs up to weaning time.

"Small amounts of alfalfa (lucerne) and cod liver oil, which are rich in vitamin A, are effective supplements for white maize rations. They correct completely the deficiency of such rations in this important vitamin, and where pigs are kept out of doors, exposed to direct sunlight, they appear to render white maize as valuable as yellow maize for growing and fattening pigs and brood sows."

The results recorded above are more of scientific interest than practical importance, for no breeder would feed his pigs on maize alone and expect to raise healthy animals. It is possible to lay too much emphasis on the slight difference in the feeding value of white and yellow maize. It is well known that even yellow maize from a nutritional standpoint, while a valuable food, is a very imperfect one. Yellow maize is notably deficient in its protein constitution and also has a very low ash content. Many experiments have been carried out on pigs feeding yellow maize alone, and practically without exception nutritional disorders have occurred. The need of a varied diet is almost as essential in animal feeding as in human nutrition, and the farmer who pays attention to variability and also palatability of the rations he is feeding to his farm stock is undoubtedly the most successful animal breeder.

Experiments carried out in Germany by Foerster show that where diets well balanced as regards protein and minerals were fed to pigs no beneficial effect was observed on introducing cod liver oil to the ration of some of the animals.

Rhodesian Paintings.

Visitors to the Salisbury show will have seen the excellent paintings of Rhodesian scenery, etc., exhibited by Miss Cheeseman, the well-known artist, who is at present executing various commissions for the Government of this Colony. Miss Cheeseman authorises us to state that she is prepared to paint any particular subject, such as a homestead, farm animals or a view, as may be desired. Miss Cheeseman may be communicated with at the Department of Lands, Salisbury, where she has her studio and where she will be pleased to show specimens of her work to visitors.

Notes from the Veterinary Laboratory.

By LL. E. W. BEVAN, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

"*Where every prospect pleases.*"

It is the prerogative of the Englishman to decry and belittle everything that is his; the Rhodesian, however, does not suffer from the modesty complex, but loudly asserts that his is "God's own country," "the land of sunshine" and, above all things, "pre-eminently a stock-raising country."

Let us enquire a little more fully into the last contention. It is said that when the white man arrived this country was teeming with native cattle. How is it then that at the present time 95 million acres of land are carrying only a little more than two million head of cattle? This does not at first sight suggest any pre-eminent suitability of the country for stock, and yet, when we come to analyse the position more closely, there is every reason to support our optimist's contention.

Few countries in their early days have been more chastened by plague, pestilence, famine, murder and sudden death than Southern Rhodesia. Nevertheless, in spite of all, it is making good and its cattle industry is coming into its own. It must be remembered that Southern Rhodesia occupies geographically a very unenviable position, constituting, as it were, a buffer between the north and the south, and so in the days when veterinary supervision was not what it is to-day it was a ready victim to cattle diseases passing from north to south, or *vice versa*. So that in the last 50 years pleuro-pneumonia, rinderpest and East Coast Fever have swept through the country, depleting our herds and reducing our stock almost to extinction. The fact that the industry has survived, therefore, is evidence of wonderful powers of recuperation. Official records tell us that in 1904

there were less than 125,000 cattle in the country; to-day there are over two millions. Veterinarians may well be proud of these figures and take some of the credit for them.

Let us discuss some of those diseases which we have enumerated and see how science has brought about our present freedom from them.

Pleuro-Pneumonia, or, as it is generally known, *lung sickness*, was introduced into Cape Colony in 1854 by some Friesland bulls which were imported from Holland and landed at Mossel Bay. From that date it has spread all over South Africa and has been the cause of serious annual losses of cattle in the sub-continent. The following very interesting history is taken from Edmonds' "Diseases of Animals in South Africa":—

"In 1861 it reached as far inland as Matabeleland and caused heavy losses in this at that time heavily stocked country. Umziligasi, the king of the Amandibele nation, called to his assistance in dealing with the plague Messrs. Moffat, Sykes and Thomas, of the London Missionary Society, who were resident in the territory, and inoculation was practised; but the disease destroyed many cattle and became enzootic in the country, so when the Matabele, after their periodic raids into surrounding territories, returned with numbers of loot cattle, a considerable proportion of these animals contracted the disease and died.

"In 1893, when Matabeleland was occupied by the British South Africa Company, and during the following years, the disease was very prevalent. Rinderpest in 1896 destroyed many lung-sickness infected cattle; but the disease survived the ordeal, and when the country was again being re-stocked after rinderpest had swept through and died out, lung-sickness again came prominently into view and destroyed many of the recently imported cattle.

"In 1901 lung-sickness was present to a great extent; but the introduction of East Coast Fever took place that year, and during the following years the spread of the latter disease destroyed a great number of lung-sickness cattle, and finally eradicated the disease in about 1903 or 1904, since when the disease has not again appeared in Rhodesia."

In this way East Coast Fever proved a "blessing in disguise," and the writer has heard the late Chief Veterinary Surgeon, Mr. C. E. Gray, express this opinion.

Pleuro-pneumonia is a particularly difficult disease to deal with by reason of its insidious nature and the fact that a large number of recovered animals become "lungers" or "carriers" of the disease. Having recovered from an acute attack, a diseased area of their lungs may become encysted, and at some future date the tissues around the affected areas may break down and the animal once again become an active source of infection. It is in the detection of these "lungers" that the difficulty in dealing with the disease arises; it was by their elimination that rinderpest and East Coast Fever played a useful part.

This disease exists still in the countries to the north and south of Southern Rhodesia. The freedom of this country must be largely attributed to the vigilance and prescience of the Veterinary Department.

The method of conveying immunity by inoculating animals with the fluid from the chest cavity of an infected animal is as "old as the hills." It is said that in Senegambia there existed a custom, the origin of which is lost in the obscurity of antiquity, whereby cattle were protected against pleuro-pneumonia (lung-sickness). De Rochebrune gives the following description of the process:—"The point of the knife of primitive form, or of a dagger, is plunged into the lung of an animal that has died from the disease, and an incision, sufficient to allow the virus to penetrate below the skin of the healthy animal, is made in the supranasal region. Experience has demonstrated the success of this operation." The existing method of protective inoculation against this disease is but a slight advance upon this primitive method.

The method, however, has been improved and a vaccine prepared by growing the microbe artificially has been issued on a large scale by the Chief Veterinary Research Officer, Kenya Colony, and in his report for 1925 he says: "This disease has ceased to be of economic importance to stock owners, who can protect their stock by using a vaccine which is issued free on demand by the Veterinary Laboratory. 295,320 doses were issued for use in the Colony during 1925."

This new method largely does away with the disadvantages associated with the old crude method, and seldom does one now meet with tail-less cattle, the victims of the old haphazard method of inoculation. With this method available, and with the veterinary organisation as perfect as it is in this country, the menace of pleuro-pneumonia is reduced to a minimum.

Rinderpest is a disease which invaded Rhodesia from the north in 1896, and is said to have been brought into this country by missionary cattle which, having crossed the Zambesi River, were brought down through the Mafungabusi district. At that time the country was heavily stocked with cattle and game, both of which were decimated by the disease. The losses in Matabeleland are estimated at about a million and a half. Edmonds, in the book previously referred to, says "the only means of communication between Rhodesia and the south was by road, and all along this were carcases of rotting dead animals; in consequence, one unending stench stretched from Bulawayo to Palapye." The disease made its way south to the Transvaal and the Cape Colony, where, during the years 1897 and 1898, over one million head of cattle are said to have died of the infection.

"The contagium is contained in the excretions and secretions of the body, in the red corpuscles of the blood, in the peritoneal fluid, but not in the bile or blood serum; but blood-stained bile or serum containing the slightest trace of red colour is virulent." (Cross.) Koch, when studying the disease in South Africa in 1896, recognised that the bile from the gall bladder of infected animals, when injected into susceptible animals, conferred upon them a certain degree of immunity. He believed that the organism of rinderpest present in the bile was restrained by the preventive action of the bile. This discovery was eagerly welcomed and largely made use of; but the bile inoculation presented several disadvantages, in that only certain biles were suitable, and, as only a limited supply could be obtained from any one animal, a large number of cattle had to be sacrificed to provide sufficient and suitable material. Moreover, putrid or red-coloured biles could not be used. Pure bile had to be used within four days of collection, and its immunising effects were not complete until some ten days after injection,

the immunity conferred being of short duration—not more than four months on an average. As the proportion of virus and immunising substance present in different biles varied, the results were irregular. Edington claimed to have overcome many of these disadvantages by adding a certain proportion of glycerine, such glycerinated bile remaining active for considerable periods. It was safer than pure bile and was thought to possess some curative properties and also to confer immunity of a temporary or "passive" nature. The dose varied from 15 c.c. to 30 c.c., according to the size of the animal, and a subsequent injection of pure bile was sometimes given ten days after to prolong the immunity conveyed.

Koch, in 1897, reported to the Secretary of Agriculture of the Cape Colony "that blood serum of cattle which have recovered from rinderpest had a certain immunising effect upon healthy stock when inoculated with it." After some valuable work by Bordet and Theiler, who showed the immunising effect of defibrinated blood from recovered animals, Kolle and Turner elaborated the idea adumbrated by Koch and placed the serum method of conveying immunity upon a sound basis. They introduced the method of "fortifying" or "hyperimmunising" recovered animals with successive doses of virulent blood, so that a serum of higher potency—that is, richer in anti-bodies—was produced. By inoculating all susceptible animals likely to come into contact with infection with standardised doses of such serum, a passive immunity, lasting some eight or ten days, was afforded, and by repeating the doses at intervals it was often possible to protect animals during the course of an outbreak. Later this method was improved by the sero-virus inoculation, which consists of the introduction of virus controlled by a simultaneous injection of immune serum in another part of the body, the quantity of serum necessary to control the virus being based upon the strength of the virus used, the susceptibility of the cattle to be treated and the restraining power of the serum, the quantities being standardised by preliminary experiments. "We thus obtain a double immunity, one part immediate, the other permanent. To get this result, however, the serum must not be mixed with the virulent blood, for when this is done the immunity con-

ferred is trifling or nil. On the other hand, it is complete and persists for several months when the protective serum is injected separately on one side of the body and the virulent blood on the other." (Metchnikoff.) This method has now been adopted in nearly all countries ravaged by rinderpest and has proved of inestimable benefit in controlling this plague.

The disease disappeared from Rhodesia in 1902 and has not since re-appeared, although it has existed to the north in Central Africa as far south as in Tanganyika Territory. Large stocks of serum are prepared at the veterinary laboratories in that territory and at Kabete, in the Colony of Kenya, and it is confidently believed that, with an efficient veterinary force and an adequate stock of immunising serum standardised to local conditions, Southern Rhodesia will never again be subjected to a serious visitation of this disease.

Glanders is a disease of equines transmissible to man. At one time it was very prevalent in Southern Rhodesia, but in 1898 steps were taken to eliminate it. By applying the mallein test to all horses, mules and donkeys in the country, and to all equines entering the territory, the disease was finally eradicated. No case has been met with in Southern Rhodesia since 1911—a fact upon which the Veterinary Department is again to be congratulated.

Rabies is another of those diseases which at one time existed in this country and have been eliminated. In view of the vast areas of this country occupied by wild animals susceptible to this disease, the enormous number of kaffir curs owned by the natives and the limited number of officials to enforce the restrictions, the rapid and final elimination of this terrifying disease constitutes another victory to the veterinary profession.

Having discussed the diseases which in the past have seriously handicapped the progress of the pastoral industry and have been successfully eliminated, let us proceed to "count our blessings" and consider some of those maladies which exist in other countries and from which we are fortunately free.

Foot and Mouth Disease is an infectious malady of cattle, sheep and pigs. Exceptionally, man may become infected, and recent experiments which have considerably added to our knowledge of the disease have proved that by certain methods guinea pigs can be infected by injecting the virus into the pad of the foot. Such a discovery will no doubt cause amusement to the practical man, but is of the greatest scientific importance, in that the disease can now be studied rapidly, efficiently and cheaply under strict laboratory conditions. As the result of experiments on these small laboratory animals a greater knowledge of the disease has been acquired within the last few months than in the past centuries, and the prospect of producing a method of protective inoculation is brought nearer realisation than ever before.

This is a disease from which, fortunately, Rhodesia is entirely free, although it exists to the north in the Kenya and Tanganyika territories. It is not a disease which causes a high mortality, but affected animals rapidly lose condition; infected cows cease to yield the usual quantity of milk, and severe restrictions have to be imposed to prevent the dissemination of infection. It is thus a cause of serious economic loss in countries where it does exist. It may be well, therefore, to discuss very briefly the nature of the infection, its viability and common methods of dissemination.

The cause of foot and mouth disease is believed to be an ultra-microscopic micro-organism so small that it will pass through certain porcelain filters. It is present in its purest state in the contents of the characteristic vesicles which develop on the lips, gums, tongue, teats, udders and feet of infected cattle. It is present in the saliva, tears, nasal discharge, milk and in other secretions which become contaminated from the ruptured vesicles. It is infective, not only to bovines, but to sheep and sometimes to pigs, and experimentally to rabbits, wild and white rats and, as said before, to guinea pigs. Infection easily takes place by direct transmission from sick to healthy, but more commonly is conveyed indirectly through materials contaminated with the infected discharges. The virus is under certain conditions very resistant, and in experiments "using vesicular fluid unfiltered, but diluted 1 in 5, it was found that on drying

on paper in the air of the room at ordinary temperatures the virus was inactive after six or nine days; on silk fabric, after 14 days; on woollen fabric, after 21 days; on hay the virus was active after from 8 to 20 weeks; on flour, after 7 weeks, but not 12 weeks; on cow's hair it was inactive after 6 weeks; on sand, after 3 weeks; and mixed with salt butter it was active after 2 weeks, but not after 3 weeks." These observations have a very practical application.

Foot and mouth disease is almost constantly present in the continent of Europe, and, as we know to our cost, from time to time makes its appearance in Great Britain. The manner in which outbreaks have originated has given rise to much speculation. They have been attributed to hay, packing materials, mud on motor cars, birds and a hundred and one other possible sources; but recently it has been found that the carcases of cattle and pigs which have been slaughtered in the early stages of the disease and have been chilled or frozen and dressed for market contain the virus for as long as 30 or 40 days in the blood, and in the bone marrow for even longer periods—in two instances for 76 days. After dry and wet salting, the virus was recovered from the bone marrow after 42 days. "The disease was readily conveyed to pigs by feeding them on crushed bones from the frozen carcases containing infected marrow. Imported carcases of pigs with lesions of foot and mouth disease on them were proved to contain the virus by experimental infection of cattle at Pirbright with material from the foot lesions." These discoveries afforded an explanation for many of the outbreaks which in the past have defied investigation, and justified regulations controlling the importation of such carcases. Since then the number of outbreaks has been materially reduced in Great Britain, and from time to time the country has been declared free. Unfortunately further outbreaks have occurred, and the embargo placed by overseas governments upon stock from Britain, temporarily released, has been re-imposed. The importation of cattle from "Home" to this country, where they are so badly needed to improve our local stock, has thus been prevented, and Rhodesia, in common with most other countries which go to the great stock "nursery" for their stud animals, has suffered severely.

In view of what has been written above concerning the

easy transmission and resistance of the virus, it is a matter for congratulation that Rhodesia is free from this insidious and costly disease, and it is to be hoped that, by the efforts of the Veterinary Department, it may ever remain so.

In future notes it is proposed to deal with some of the many diseases prevalent in other countries, but from which Southern Rhodesia is free and from which it may remain free if veterinary science is supported by the good will and practical assistance of our stock owners. The motto of the veterinary profession is *Vis unita fortior*—Unity is strength—and the strength of the pastoral industry in this Colony largely depends upon unity between the veterinarian and the public.

CORRECTION.

In the Rhodesian milk records which appeared in the last issue of the Journal it is stated that the cows "Melrose Frederika" and "Wolseley Josephine," the property of Mr. W. R. Waller, Salisbury, produced 7,636.0 lbs. and 6,815.0 lbs. of milk respectively in 300 days. These figures should read 8,636.0 lbs. and 7,816.0 lbs. respectively.

The Hydraulic Ram.

[*An article on this subject appeared in the* Rhodesia Agricultural Journal *of February*, 1920, *the author being Mr. A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E., Government Irrigation Engineer. A portion of what then appeared has been retained in the following article written by Mr. P. H. Haviland, B.Sc., Assistant Irrigation Engineer. It should be noted that the information given below replaces that relating to hydraulic rams which appeared in the article entitled "Domestic Water Supplies," published in this Journal for January*, 1927, *and reprinted as Bulletin No.* 632.—*Ed.*]

Although hydraulic rams are a comparatively old invention, there is perhaps no piece of hydraulic machinery about which so much obscurity exists in the public mind. Their utility for pumping water and low cost of maintenance and upkeep render them especially suitable for water supplies on farms and other places where very large quantities are not required. The ram is in reality a self-acting pump, in which the momentum of a stream of water falling a small height is utilised to raise a portion of the water to a greater height.

Let h = Height in feet the water falls to ram.
,, H = Height in feet to which the water is lifted.
,, W = Weight of water in pounds per second descending to ram.
,, w = Weight of water in pounds per second lifted by ram.
,, e = Efficiency of ram.

Then theoretically Wh should equal wH.

In practice, however, owing to pipe friction, slipping of valves and loss of water in the operation of the ram, this result cannot be attained, and the actual water raised through a height H will be—

$$w = \frac{e \times W \times h}{H}$$

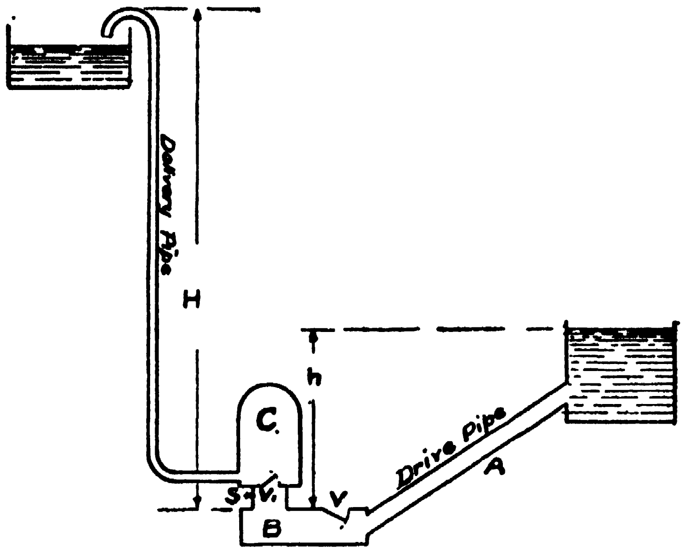


Fig. 1.

Referring to Fig. 1, the operation of the ram may be briefly described as follows:—Water is supplied from a tank or stream through a drive pipe A into a chamber B, which has two valves V and V_1. When no flow is taking place valve V is open and V_1 closed. If water now flows along the pipe A it will escape through the open valve V. As the water passing through V increases in velocity, the impact on the underside of this valve causes it to lift and suddenly close. The rapid closing of the valve causes a "kick" or water hammer in the pipe, and there is a sudden rise of pressure in B, which causes the valve V_1 to open and a portion of the water passes into the air vessel C. The kick, or hammer, transmitted through the ram is overcome by the greater pressure in the pipe D, and a re-action or backward pulsation is set up which closes valve V_1 and unseats valve V. The cycle of operations is then repeated, more water being forced into the air chamber C, in which the air is compressed, and the water is forced up the delivery pipe D to the desired height. The backward pulsation or recoil is utilised to draw air through a small valve S opening inwards only, and called a snifting valve, which replenishes the air vessel and prevents it becoming water-logged.

The percentage lifted of the total quantity of water which is supplied to a hydraulic ram decreases as the ratio of the height lifted to the working fall increases. This, however, is not the only factor to be considered. As the actual working fall increases, the percentage of water lifted increases for the same ratio of lift to fall.

Thus with a working fall of 6 feet and a ratio of lift to fall of 10 to 1 (water being raised to 60 feet), the percentage lifted of water supplied to the ram is approximately 5 per cent.; and with a working fall of 12 feet and a delivery to a height of 120 feet (ratio of 10 to 1), the percentage is increased to about 6¼ per cent.

The table below serves as a very approximate guide to the percentage of water raised. The figures given refer to two definite working falls of 5 feet and 10 feet respectively, and for other falls different values will persist.

Percentage Lifted of Water Supplied to Ram.

Ratio of lift to fall	$\frac{H}{h}$	$\frac{3}{1}$	$\frac{5}{1}$	$\frac{8}{1}$	$\frac{10}{1}$	$\frac{15}{1}$	$\frac{20}{1}$	$\frac{30}{1}$
Working fall of	5 ft.	..	11 p.c.	6¼ p.c.	4¾ p.c.	3 p.c.	2 p.c.	1⅓ p.c.
,, ,,	10 ft.	21½ p.c.	13 p.c.	7½ p.c.	5⅝ p.c.	3½ p.c.	2½ p.c.	1½ p.c.

There are a number of types of rams on the market, and although the principles upon which they operate are the same, the actual operation may vary slightly. It is therefore advisable, in installing a ram, to follow closely the instructions issued by the manufacturer.

Rams of varying sizes can be operated over a wide range of conditions, with flows ranging from 2 to 400 gallons per minute, and working falls of from 3½ to 100 feet, delivering water to a height of 500 feet. Varying the length of the drive pipe of a ram has the effect of altering the number of beats per minute, and manufacturers and agents usually state the actual lengths required for specific cases. The approximate length of drive pipe required may, however, be taken as seven times the working fall. The actual size of drive pipe varies with the size of the ram, and consequently no rule as to sizes can be given, but information on this subject is given by makers.

As regards the actual fall required for operating a ram, it is of advantage in general to make use of the greatest available fall, but this working fall should, however, be not greater than one-third of the lift; thus for a lift of 50 feet the working fall should not exceed 17 feet.

Where a large delivery of water is required and sufficient drive or operating water is available, it is better to instal several small rams than one very large one on account of a possible decrease in stream flow. If such a diminution of supply occurs the number of rams operating may be reduced in proportion, whereas if one large ram were installed this would cease operation completely when the quantity of drive water got below the ram's minimum working amount.

Rams can be arranged to operate with various sources of supply, including foul water, which would operate a ram delivering clean water; but the most common cases are those where a small natural stream having a moderate fall or an irrigation furrow is available. In the former case a small weir or dam can usually be placed across the stream and the water led out by means of an open channel or pipe-line to a point where the requisite fall can be obtained direct to the ram, as illustrated in Fig. 2. Where an irrigation furrow is conveniently situated to give the fall necessary to operate a ram, the installation is a comparatively simple matter. The drive pipe, which must have its intake end suitably protected, can be taken direct from the furrow and carried down to the ram, from whence the delivery pipe can

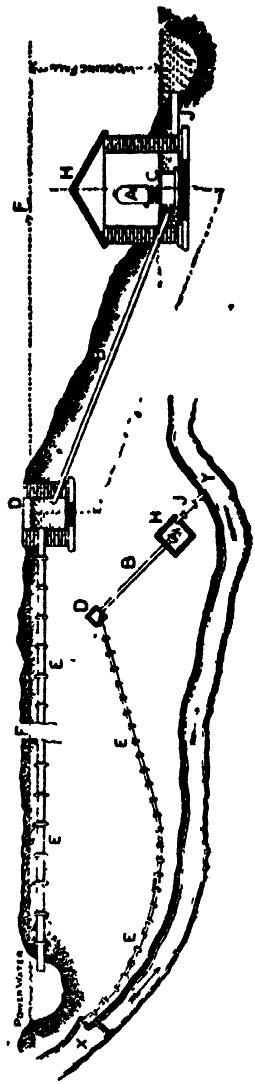


Fig 2

be led to an overhead storage tank or other elevated point, as desired. In certain cases the ram could be operated at night or at such times when the water in the furrow is not required for irrigation. If an irrigation furrow has a sudden drop in it, this also forms an admirable point for installing a ram.

Rams must be firmly bolted down upon a concrete foundation and a drain provided for carrying off the waste water from the escape valve. It is not advisable to place rams in river beds, where they may be damaged during periods of flood; but if it is necessary, suitable protection must be afforded in the form of housing. It should be noted that a hydraulic ram will not work under water.

In Fig. 3 is given an illustration of a Blake's ram, with a cross section of the ram in Fig. 4.

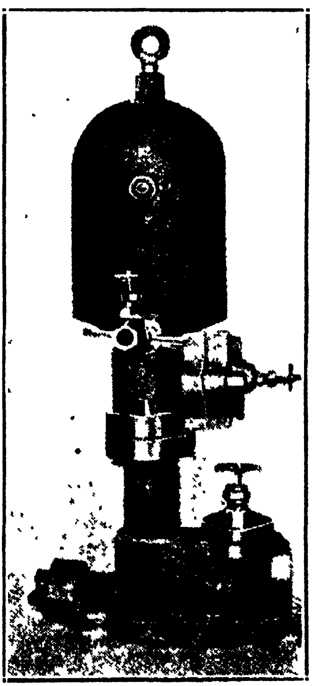


Fig. 3.

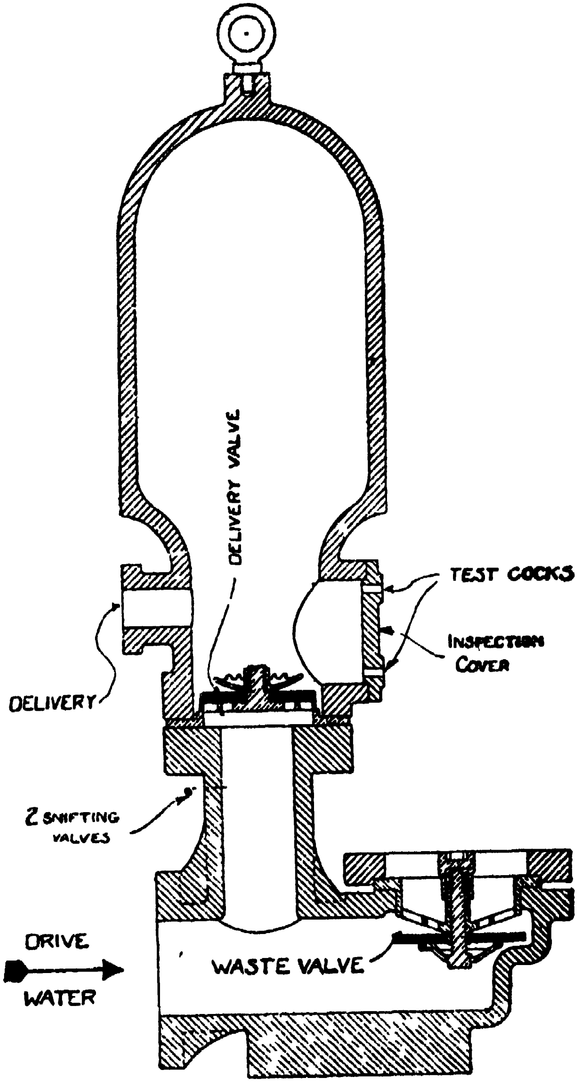


Fig. 4.

The actual size of delivery pipe required will depend upon the quantity of water being delivered, the length of the line and the kind of piping used, and professional advice should be sought in this connection.

In considering the water available in a stream or spring, the minimum flow should be used to determine the size of the ram, otherwise one may be selected which is too large to be actuated by the dry weather flow. The method of gauging a stream is described in Departmental Bulletin No. 632: "Domestic Water Supplies and Sanitation on the Farm," reprinted from the *Rhodesia Agricultural Journal* for December, 1926, January, February and March, 1927.

Where water can be diverted for irrigation from a river by means of a gravitation furrow it would not in the ordinary way be economical to lift water by a ram, although in certain cases batteries of rams capable of pumping quantities of water up to one-quarter million gallons per diem have been installed with success. Normally the function of a ram on the farm is limited to providing supplies for domestic and stock purposes, and in this connection rams are most economical and efficient.

It is advisable to cover in all small furrows conveying drive water to a ram in order to prevent the entry of leaves and debris, which would choke the machine. A screen should also be placed at the outlet end of the furrow before the commencement of the drive pipe. The inlet end of the drive pipe is most suitably situated in a concrete box, which will also serve as a silt and sand trap. Where the quantity of drive water is small it is advisable to line the supply furrow with brick or concrete in order to prevent seepage losses.

Farmers and others contemplating the erection of a ram would be well advised to first seek professional advice.

The illustrations used in this article have kindly been loaned by Messrs. Stewarts and Lloyds (South Africa), Ltd.

African Coast Fever.

By J. M. SINCLAIR, Chief Veterinary Surgeon.

The campaign against Coast Fever inaugurated in January last has proved most successful so far, thanks largely to the goodwill and co-operation of the stock owners in the areas involved. *To my mind the most satisfactory result has been the detection of infection at the earliest possible stage; in six instances there has been one case of disease only so far.* I know that some persons are critical of the diagnosis in these cases, but I am convinced that they were all genuine Coast Fever. In the ordinary course of events these cases would not have been detected, no precautions would have been taken, and at a later date—possibly twelve months hence—we would have been faced with fresh outbreaks, and everyone, including members of the Department, would have wondered where the infection came from.

In my annual report for 1921 I made the following remarks:—

> "No case of Coast Fever occurred anywhere in the Territory from 1st June until the end of the year. Although the position is more satisfactory than at any time since the introduction of the disease in 1901, I am not sanguine enough to say that the complete eradication of infection is within sight. Time after time recrudescences have occurred long after areas had been released from quarantine, and fresh outbreaks have unexpectedly and inexplicably occurred in districts not previously affected. It is necessary, therefore, that there should be no relaxation of the present restrictions and procedure; the greatest vigilance should be exercised by stock owners and officials of this Department in reporting and investigating all cases of sickness and mortality amongst cattle when

the cause is not clear. The dipping of cattle as required by the regulations and the early detection of infection will assuredly result in reducing losses to a minimum and in preventing the widespread dissemination of infection in the unfortunate event of the disease existing at any centre at present unknown and unsuspected."

During the following year this apparently satisfactory position was maintained until May, when fresh outbreaks occurred in the Melsetter and Charter districts, and since then there have been many outbreaks in various districts. *What has happened in the past may happen again; indeed, will happen again unless everyone concerned puts his back and his intelligence into the job of getting rid of infected ticks.* At the present time there are upwards of 30 areas, some of them large, where disease has occurred during the last twelve months. The mortality is now at a minimum; in fact, since 1st June last there have been 20 cases only—a somewhat different state of affairs to what existed in October, 1926, when the total mortality was 1,184 head. With the advent of warmer weather and rains, ticks will become more active and there will probably be an increased mortality and possibly a fresh outbreak or two. I believe, however, that the position is better than for many years, even including the twelve months' apparent freedom from infection in 1921-22; but we have still a long way to go, and I appeal to all stock owners for the continuance of their assistance and support, without which Coast Fever will never be eradicated.

Two of the most important factors in preventing the spread of infection and eliminating recrudescences are the detection of the disease at the earliest possible period and the recording of the last case on every infected area. Every case of sickness or accident should be reported, and if no official is available for investigation, blood smears should be forwarded for examination; and in the case of dead animals, spleen and gland smears should also be forwarded. It may be said that it is a waste of time to forward smears from an animal with, say, a broken leg, but several cases have been recorded of fractured legs and necks occurring in animals affected with Coast Fever.

It is scarcely necessary to refer to dipping, but I would say, *dip to kill ticks, not because dipping is compulsory;* and if ticks are abundant at any season of the year, dip every five days or even every three days for a week or two, and hand-dress if necessary.

Smithfield Prices.

Messrs. Hart, Harrison and Co., 4 and 5, West Smithfield, E.C., kindly supply us with the following prices ruling on 15th September:—

London Central Markets.—Beef: Moderate supplies, slow trade, and prices throughout easier.

English long sides, 7d. to 8¼d. per lb.

Irish long sides, 7½d. to 8¼d. per lb.

Argentine chilled hinds, 6½d. to 7¼d. per lb.

Argentine chilled fores, 3¾d. to 4d. per lb.

Pork (home killed), 9¾d. to 12½d. per lb.

The Cattle Industry in Southern Rhodesia.

By W. FLEMING, Stock Adviser.

In a new country there is an ever-insistent call to farmers to explore every possible channel for some new branch of farming holding out brighter prospects than existing or older established systems, and at these times there is an undoubted tendency to neglect the old system whilst new ones are being experimented with. New ideas, new enterprises, new enthusiasms are the essentials to success in any country, and it is not the intention of this article to suggest any relaxation in the introduction and extension of these principles to Rhodesian farming or that every endeavour should not be made to add to the source of income. Rhodesia, however, is essentially a cattle country; its vast spaces, supplied with more than the average of water facilities and an abundance of nutritive grasses, make it pre-eminently a country in which good cattle can be cheaply reared and fattened for the markets. It would therefore be folly not to avail ourselves of nature's blessings in this respect. At the same time we must ask ourselves the question: Where are our markets, and what are the requirements of those markets?

The local markets are now no longer capable of absorbing all our surplus cattle, and even the added markets in the Union of South Africa are not sufficient to take our output of the better class of bullock. In this connection we must bear in mind the possibility of a Union embargo against our cattle and cattle products, although a co-operative undertaking between the two countries for the necessary handling and marketing of the united output would be a more useful and sane view of the actual position,

economically and otherwise. However, our principal market under any circumstances must in future be "overseas."

The success of the cattle industry of this Colony would seem to be dependent on our ability to supply the right kind of article to the English market. The essential requirements of this market are good, well-bred and properly fed young beeves. The chief source of supply to-day is the Argentine, which furnishes 81.7 per cent. of Britain's imported beef requirements as sold at Smithfield; 21.9 per cent. of her imports of mutton and lamb come from the Argentine, whilst New Zealand supplies 42.1 per cent. of this latter product.

A study of methods in the Argentine discloses the main feature of success in supplying beef to Great Britain to be the introduction consistently of Britain's best pedigree beef sires. It must be admitted that Rhodesia to-day does not possess the cattle whose carcases would find a market at Smithfield in competition with the Argentine meat. However, there is no reason at all why this Colony should not rank next to the Argentine as a meat producer. It may take some years to produce the right type of bullock for British trade, and it is felt that immediate action is necessary, in view of the time involved. The first essential is the introduction of more pure pedigree beef bulls into our herds—bulls that will transmit their characteristics to our future breeding stock.

The second essential is that an improvement must be brought about in the veld, and other conditions, under which our better class cattle will be expected to live. No good purpose will be served by placing highly-bred cattle upon pastures of low feeding value and subjecting them to unsuitable conditions. It is hoped and believed that the time is not far distant when our maize, instead of being exported (thereby impoverishing our farms), will be retained in the Colony and fed to cattle to fatten and fit them for the beef export trade.

There is another possible future outlet for our cattle that deserves the consideration of all concerned. This is the supply of young suitable stores for fattening purposes by graziers in Great Britain. These stores would have to be well bred, strong, suitable young beef animals, capable of immediate response to good treatment, in Britain. The

British Government may not be prepared to place Southern Rhodesia on the same favourable basis as Canada in this matter, but it may be pointed out that cattle from Southern Rhodesia, owing to regular dipping, would be more free from skin disease than cattle from other countries. In the meanwhile it is our duty to enquire into the possibilities of the trade and especially into our readiness and ability to give the British authorities the necessary protective assurances regarding diseases, etc. These negotiations may take years to bring to a satisfactory conclusion, but there is no reason why we should not make the necessary enquiries and at the same time lay our plans for providing the cattle that will meet the requirements of either or both of the markets referred to.

The beef industry cannot appeal to the small farmer as it does to the rancher, but the former can also rear cattle to his own advantage. Is it not a fact that many farmers hold more land than that which is profit-earning, and could not such land be made to carry small numbers of dairy cows, which would (if fed whilst in milk) help to retain and increase the fertility of the farm generally? Here again the farmer will enquire: Where is my market? The local market for milk, butter and cheese products is quite good. True, it needs organising to secure the greatest benefits, whilst at present the markets of the Union are available for cream and butter to a limited extent. Export beyond the confines of the Colony is the chief hope of the future, and warrants the farmer of to-day availing himself of the assistance which the Government offers to secure suitable dairy animals for the building up of this important industry.

Rhodesian farmers are fortunate in possessing really good female bovine stock upon which sound beef herds can be built up. It is, however, necessary to weed out the uneconomical beast and to improve the conditions under which animals are kept. The class of stock we require can only be produced by the introduction into our herds of the best possible proved stud sires of recognised beef breeds, and the fact cannot be emphasised too strongly or too often. The same principles apply to our dairy herds, and it is only by the introduction of the right type of animal that we can hope to develop our dairy industry.

Small Earthen Storage Reservoirs.

(Concluded.)

(An article bearing the above title appeared in the Rhodesia Agricultural Journal *for April,* 1915, *the author being the late Mr. W. M. Watt, Irrigation Engineer. This article has now been revised and added to by Mr. C. L. Robertson, B.Sc., Irrigation Engineer, and generally brought up to date.*—Ed.)

Evaporation and Absorption Losses.—The full quantity of water stored in a dam at the end of the rainy season is not available for irrigation during the winter owing to certain unavoidable losses of the stored water, due to evaporation from the water surface and to the absorption of water by the soil in the neighbourhood of the impounding basin. For these reasons it is usual to consider, as previously mentioned in this article, that in small dams four acre feet of water are required to be stored for the irrigation of one acre, *i.e.*, if all this water were available for irrigation it would mean the equivalent of 48 inches of rain on the irrigated area during the irrigation season, whereas actually only about 24 inches are required for ordinary crops. In other words, one has to store twice as much water as is required for actual use. This is not the case if the dam is fed by a perennial stream which is capable of supplying sufficient water in all seasons to neutralise the evaporation and absorption losses.

The cost of flood storage for irrigation is therefore materially increased if there is no small perennial stream supplying the dam.

This fact serves to emphasise how important it is that erosion should be prevented on the headwaters and catchments of streams, as the ultimate effect of erosion is to transform a perennial stream into a flood torrent during the rains and a dry donga during the winter months.

In a well constructed dam the more serious loss of the two is that due to evaporation.

The following table shows the mean monthly evaporation from the Cleveland Dam, Mashonaland, and Bulawayo Dam, Matabeleland:—

EVAPORATION LOSS: FREE WATER SURFACE.

Month.	Cleveland Dam. Monthly total (inches)		Bulawayo Dam. Monthly total (inches)	
October	10.88		11.37	
November	8.95		9.91	
December	8.03		9.07	
January	7.47		9.74	
February	6.37		7.60	
March	7.40 (wet season)		8.25 (wet season)	
	——	49.10	——	55.94
April	7.00		8.12	
May	6.30		6.75	
June	5.35		6.16	
July	5.40		6.29	
August	6.82		8.12	
September	8.74 (dry season)		9.51 (dry season)	
	——	39.61	——	44.95
	Year ...	88.71	Year	100.89

From the above it will be seen that the evaporation in this Colony varies from 7 to 8 feet per annum.

In the case of small dams which would normally overflow each rainy season, the evaporation loss need only be taken into account during the six months April to September, and, as will be seen, this amounts to between 3 and 4 feet.

Instead of the empirical figure of storage of 4 acre feet per acre irrigated previously given, the evaporation loss in acre feet may be worked out as 4 feet multiplied by the area of the reservoir when half full.

No accurate figures are available for absorption losses in well constructed dams in this Colony, but it is usual to consider the absorption loss as about half of the evaporation loss.

Assuming that flood water was required to be stored for the irrigation of 25 acres and a total watering of 24 inches required per acre, then it would be necessary to store (25 x 2) plus (6 x area of reservoir when half full) acre feet, *i.e.*, if the area of the reservoir when half full is 6 acres, the storage required would be 50 + 36, *i.e.*, 86 acre feet.

A study of the daily evaporation figures from free water surfaces shows that the evaporation loss is materially increased on windy days and that wind is almost as important a factor as temperature in producing evaporation.

By planting suitable wind breaks of tall growing trees around the impounding basin of a dam it is possible to appreciably reduce the evaporation loss, provided the area of the impounding basin is not too large. In all cases advice on these matters can be obtained from the forestry branch. It is obvious, however, of course, that it is not advisable to plant trees on the dam embankment itself.

The capacity of a dam is also reduced by the gradual deposition of silt in the impounding basin. In Southern Rhodesia this should never become so serious a problem as in more arid countries. The natural vegetation which covers the surface of the ground prevents undue erosion. When, however, the rains fall on burnt veld or on bare cultivated land where no erosion protective measures are in operation, this does not apply, and the capacity of a reservoir may be seriously reduced owing to silting.

In certain parts of Matabeleland, where heavy sand is transported along the river beds by floods, the question of the possibility of storage works being silted up has to be considered.

Design of Embankment.—All these various factors having been considered, the height of the proposed dam will be determined, and it is necessary to decide on an adequate section for the embankment.

In this connection it is again emphasised that a "free board" of at least 2 feet should be provided above the estimated maximum flood level in order to secure a margin of safety for abnormal floods and wave action, *i.e.*, the crest of the dam should be 5 feet above spillway channel for a maximum depth of flood of 3 feet.

Further, it is often usual to build the embankment a foot or two higher at the centre and deep sections than at the flanks, in order that if by any mischance the dam is overtopped, the low sections will breach first and thus lessen the cost of reconstruction.

An allowance must also be made for settlement, as, no matter how well the dam has been consolidated during construction, its weight tends to still further compress the earthwork. The settlement of an ordinary farm dam will be about one-twentieth of its height, therefore a 20-foot high embankment should initially be built a foot higher than this.

It is advisable also to build a dam slowly so as to let its power of self-consolidation come gradually into effect. For dams over 20 feet in height the farmer should have professional assistance for the design and construction of his dam. For dams 15 feet in height and under the following dimensions are recommended:—Top width 6 feet, upstream slope 2 to 1, downstream slope 1½ to 1, free board 2 feet. If comparatively loose and friable material is only available, the slopes should be increased to 3 to 1 on the upstream face and 2 to 1 on the downstream face. A slope of 2 to 1 means that for every foot of vertical height the width of the base will be increased by 2 feet, and a slope of 1½ to 1 that for every foot in height the base will be increased by 1½ feet.

The object of a puddle trench and puddle core is to interpose a water-tight partition and thus keep all material downstream of it as dry as possible and reduce infiltration below the sole of the dam to a minimum.

It is necessary that the puddle trench should be carried deep enough to intercept such sub-soil flow as would in time carry away particles of the sub-soil and thus result in the eventual undermining and destruction of the dam.

Where good material is available for the embankment a puddle core is not necessary, but in this Colony, where first-class material is not usually available in any quantity near the site, a puddle core is an essential.

The material available is distributed in the embankment as follows:—

The puddle clay is utilised for filling the puddle trench and for making the central hearting or core wall, which is

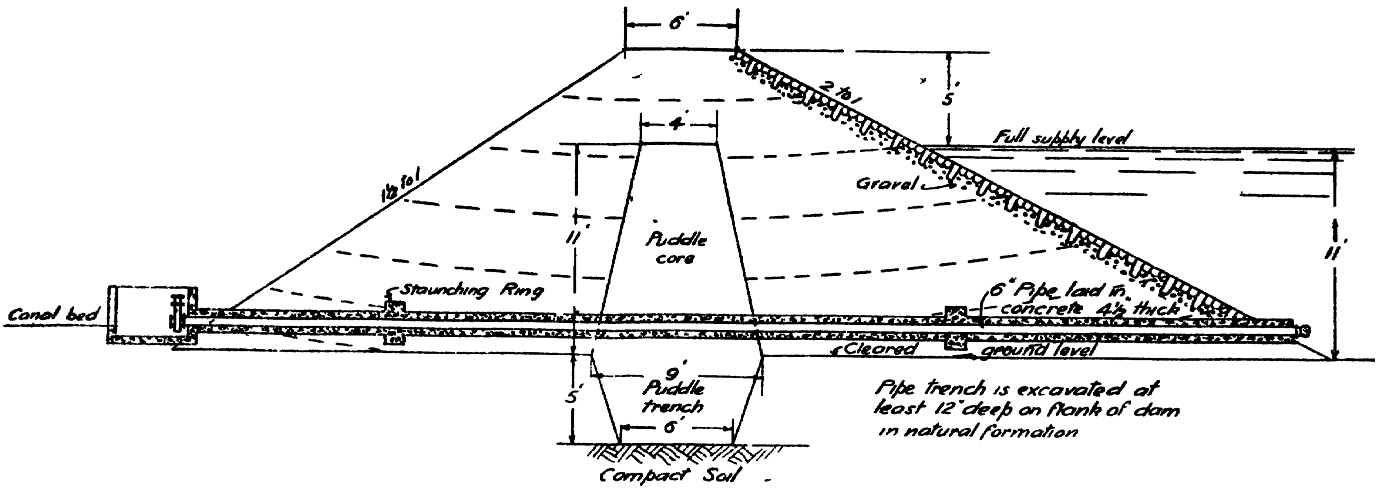

6'
4'
5'
2 to 1
1½ to 1
Full supply level
Gravel
11'
Puddle core
11'
Staunching Ring
Canal bed
6" Pipe laid in concrete 4½ thick
Cleared ground level
9'
Puddle trench
6'
5'
Compact Soil
Pipe trench is excavated at least 12" deep on flank of dam in natural formation

Fig. I.

prevented from slipping by side sections of "selected material" of shaly soil. On the upstream side this material is of as impervious a nature as possible and should not contain any pebbles or unduly coarse material, whilst on the downstream side the coarse and more shaly material may be used to advantage.

A section of a dam of this type is shown in Fig. No. 1.

Where no good clay is available the core wall should be constructed of concrete. The plan and section of an embankment with a concrete core are shown in Fig. No. 2. In this case the upstream slope has been flattened to 3 to 1, as the dam is over 20 feet in height. Selected soil is placed on either side of the core wall, with the best available soil on the upstream face and the coarser material on the downstream face. It is usual also to protect both slopes of the embankment with a casing material, which consists of layers of coarse gravel or rubble a few inches thick, and are required on the upstream side to form a firm foundation for the pitching, and on the downstream side to form a covering which will not crack when dried up by the sun and will not erode during the rainy season. In the case of low dams, instead of stone pitching the upstream face, the thickness of casing may be increased and coarse rubble used, and instead of casing the downstream slope, couch grass is planted in many instances.

Construction of Embankment, etc.—Before proceeding to construction it is necessary to peg out the base of the dam, as its bottom width will vary with the height. If the top length of the dam is not great, this can be done by stretching two wires or two lengths of strong cord across the valley at the level intended for the top of the dam and at a distance apart equal to the crest width of the dam; in low dams this is usually about 6 feet.

Measuring poles held vertically alongside the wire or cord will enable the height of the proposed bank above ground level to be ascertained, and from this the width of the base. For example, if the upstream slope be 3 to 1, and the rod held vertically alongside the upstream wire shows at one point a height of 15 feet, then the upstream toe of the dam will be 45 feet from this point, measured at right angles to the centre line of the dam.

When the base has been pegged out the surface of the whole area should be excavated to a depth of at least 12 inches, in order that a firm, solid base for the embankment may be obtained free of grass, roots and organic matter. The soil thus removed should not be utilised for forming the embankment.

(a) *Puddle Trench and Puddle Core.*—The puddle trench should be excavated continuously along the centre line of the dam and extend from full supply level on one bank to that on the other bank; the bottom of the trench should be excavated on a flat slope, with no marked steps where there are changes in depth. The depth to which the puddle trench should be excavated will depend on the nature of the underlying formation and the full supply depth of the reservoir. If solid rock or clay is not met with, it may be stated as a general rule that the trench should be excavated in compact sub-soil to a depth of one-half the full supply depth of the reservoir at the point under consideration. The bottom of the trench should be 6 feet wide as a minimum, with side slopes of 1 in 4, *i.e.*, for a trench 8 feet deep the bottom width will be 6 feet and the top width 10 feet. Any water in the trench should be drained off so as not to affect the filling.

The material employed for filling should be the best clay obtainable within a reasonable distance of the site, and should be free from vegetable, slushy matter or grit.

Before filling, the sides and bottom of the trench should be roughened and wetted. The puddle should not be wetted more than necessary to render it plastic. It should be kneaded into balls, thrown into the trench and trodden so as to secure a perfect junction. The filling should be carried out in layers not more than 3 inches in thickness, and these should be stamped so that no air-holes are left in the work. Each layer should be wetted slightly before receiving the next layer, and the whole work carried out as rapidly as possible.

In carrying the puddle above ground level this should be done simultaneously with the earthwork filling of the embankment. If the construction of the embankment is not proceeded with at once after the filling of the trench, the

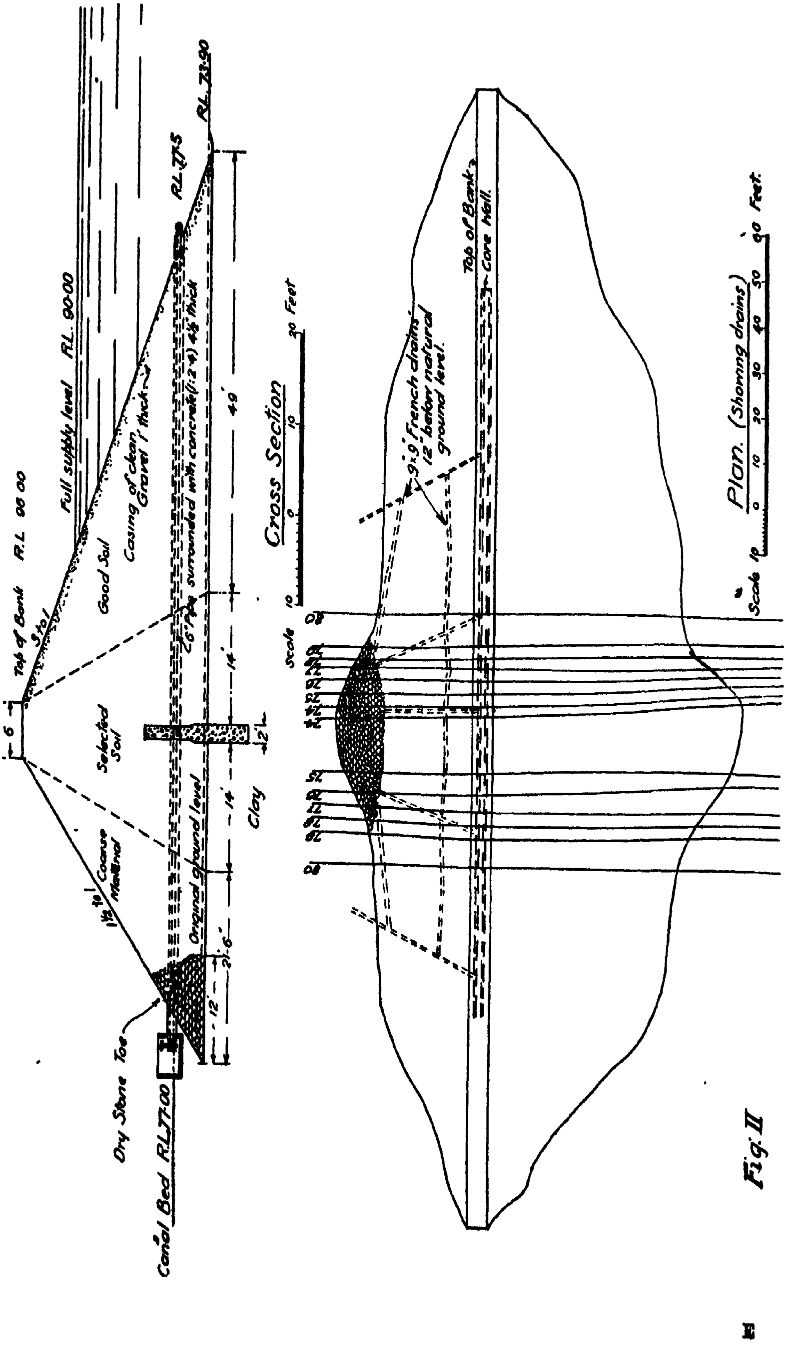

Top of Bank R.L 95.00
3 to 1
6
Full supply level R.L. 90.00
Good Soil
Casing of clean Gravel 1' thick
Selected Soil
Coarse Material
1½ to 1
Dry Stone Toe
Canal Bed R.L.77.00
Original ground level
2'6" Pipe surrounded with concrete (1:2:4) 4½" thick
Clay
R.L.77.5
R.L.73.90
12'
2'6"
14'
14'
49'
2'
Cross Section
Scale 10 0 10 20 Feet
Top of Bank
Core Wall.
9"x9" French drains 12" below natural ground level.
Plan. (Showing drains)
Scale 10 0 10 20 30 40 50 60 Feet.

Fig. II

puddle should be covered with 2 feet of soil to prevent it from cracking.

(b) *Drainage Downstream Slope.*—It is usually necessary to provide drains below the section of the embankment downstream of the puddle core; these drains should be excavated at least a foot below the ground surface at the base of the dam and filled with broken stone. They should have an even fall throughout, be led away some distance from the toe of the dam, and discharge into natural drainage channels. An arrangement of under drainage channels is shown dotted in the plan of the embankment in Fig. No. 2.

(c) *Embankment.*—Before starting the earthwork filling it is advisable to place a few batter planks in permanent position on each slope of the embankment as a guide in keeping a uniform and correct profile. These batter planks can be erected by lashing them to a peg in the ground at the toe of the embankment and the correct slope given to them. It is not necessary to carry the planks at once to the full height of the work, as they can be advanced as the earth filling proceeds.

By stretching a line horizontally behind the inside edges of any two batter planks the correct batter at any point on the slope can be obtained. By this means the profile of the slope of the wall will be kept uniform.

No earthwork for the filling of the embankment should be taken from either side of the bank nearer to the toe than a distance equal to the height of the finished bank.

In raising the embankment the earth filling should be laid in layers not exceeding 6 inches thick, and each layer properly consolidated by rolling, ramming or by stock walking over it before the next succeeding layer is applied. Each layer should be completed across the whole work before the next layer is applied, and anything in the nature of vertical junctions of earthwork should be avoided.

Before the next layer is applied the ground upon which it is to be laid should be roughened and slightly wetted, so that the new work can bind; anything in the nature of horizontal stratification of the materials should be avoided.

The surface of the layers should be almost level for a width of about one-sixteenth the section on each side of the

centre line of the dam; on the downstream side it should slope up at an inclination not exceeding 1 in 10, and on the upstream side it should slope up at an inclination which would make the upstream edge level with the downstream one. The approximate slopes of the surface of the layers are shown dotted in Fig. No. 1.

In low dams the earth filling can best and most economically be done by means of dam scrapers worked by mules or oxen. This method has the further advantage that the animals walking over the work tend to consolidate it.

In repairing an old dam the surface of the old work should be stripped and benched, so that the new earthwork is dovetailed and has a reasonable opportunity of binding, with no continuous horizontal or vertical joints.

(d) *Outlet Pipe.*—A common source of danger of failure in earthen dams is the outlet pipe. The trench for the outlet pipe should be excavated in natural formation beneath the base of the embankment at any convenient point on either flank of the dam. Under no circumstances should the outlet pipe be carried through the embankment itself, as any unequal settlement would cause leaks to develop in the pipe. For small irrigation schemes a 6-inch cast iron pipe will suffice. The pipe should be flanged at intervals and covered with a ring of concrete and concrete staunching rings as shown in the illustrations. It should rest on a broad footing of concrete to minimise any tendency to settlement. If the pipe has to pass through the puddle trench, the concrete footings on which it rests should be carried down below the bottom of the trench and the concrete well keyed into the puddle on either side.

In the case of low dams the valve may be placed on the downstream side, as shown in the illustrations, but particular care should be taken in these cases with the outlet pipe and trench. In larger works the valve should be placed on the upstream side and a valve tower constructed beyond the upstream toe of the dam, with an approach bank and bridge constructed from the embankment to the tower. The tower permits of the operation of the valve by means of vertical rods and also allows for the valves, etc., to be inspected at all times.

(e) *Pitching.*—If the impounded water surface is of any extent, the water slope of the dam should be pitched with dry stone. The pitching whenever practicable should not be constructed until the embankment has had a good period in which to settle. Pitching should consist of sound, durable stone, roughly hammer-dressed, so that they may meet all round their bases for a depth of at least one-quarter of their height and completely cover the embankment. A large proportion of them should have a horizontal section at the base of not less than 50 square inches. The stones should be firmly embedded on a layer of small, broken stone at least 6 inches in thickness, and should be laid with their broadest ends downwards. Any spaces between the stones should each be filled with a single large chip well driven home.

The foundation course should consist of a line of headers, the depth of which shall be a foot in excess of the pitching stones abutting on them. The top course should consist of a line of headers, which shall project 9 inches beyond the face of the pitching and should be fitted together with close joints in a continuous line parallel to the top of the dam. The cost of the various items in the work will vary considerably in each individual case, owing to the class and cost of labour employed, the proximity of suitable material, whether dam scrapers are used, etc. The main item is the cost of the earthwork in the embankment. The price of this may be taken to vary from 1s., if let out to contract, to 6d., if the work is performed with the farmer's own labour.

Flue-Curing Tobacco Barns.

12 ft. x 12 ft. x 16 ft.

By B. G. GUNDRY, Irrigation Branch.

In response to numerous requests for details of the 12 ft. tobacco barns similar to those built at the Tobacco Experiment Station, Salisbury, in 1925, the drawings, which have been revised and brought up to date, are reproduced herewith, together with a general description and schedule of quantities.

As this design is equally applicable to the larger barns (16 ft. x 16 ft. x 20 ft.), a schedule of quantities is also included for this size of barn.

Certain details, particularly with regard to the furnace, are subject to a good deal of controversy, and, apart from broad principles, the best type and general arrangement of the furnace is still very much a matter of personal opinion.

Site.—The most suitable site for the buildings will, to a great extent, be determined by local conditions, but should preferably be where good foundations can be obtained. Close proximity to the homestead is a useful factor on account of the better supervision possible; but, as well as this, convenience to the tobacco lands themselves must be considered as reducing the distance the leaf has to be conveyed after picking.

A supply of water is necessary at the barns, and this will also be a governing factor in choosing the site.

As regards the direction the barns should face, this to some extent is governed by local circumstances, but they

should preferably be so arranged that the furnaces are on the side distant from the prevailing winds.

General.—The design and specification given will, if carried out in detail, provide a building of a permanent and substantial nature. While a structure of good burnt brick is strongly recommended, "Kimberley bricks" or the *pisé de terre* method of construction may be adopted where suitable material is easily procurable, although it is questionable whether such methods are, in the long run, appreciably cheaper than that of using burnt brick. Where good native timber or gum poles can be obtained, these may be used for the roof timbers in place of imported timber, with the exception of the purlins and ventilator timbers, which, in order to obtain a good even roof, are better made from the latter. It will be seen from the schedule of quantities and prices that the timber for the tiers form an expensive item, and native timber may again be substituted and will be quite satisfactory.

Foundations.—A suitable site having been cleared of all vegetation, including the roots of trees, etc., and levelled, the foundation trenches may be dug. These should be about 2 ft. 6 ins. wide and carried down until a good compact formation is encountered. In the majority of cases a depth of 18 ins. or 2 ft. will be found to be sufficient, and there is nothing to be gained by going beyond this depth, unless an appreciably harder formation is encountered. Before the foundations are laid the bottom of the trench should be well rammed to ensure a solid bed for the structure. This operation will reveal any soft spots, which, if found, must be consolidated by further ramming.

Where good building stone is readily obtainable the foundations may be built of carefully bonded masonry, but owing to the labour involved in dressing the stones and the additional time required to lay them, it is doubtful whether such foundations are more economical than brickwork, but when durability is considered they are superior. The foundations, whether of brick or stone, should preferably be laid in cement mortar (1 in 4). A slightly cheaper method is to use a mixture of 1 in 5 lime mortar, and point and plaster the foundations with 1 in 4 cement plaster when completed.

Where the foundations are built of brickwork, only sound and well burnt bricks should be used. The foundations, which should be carried at least 6 ins. above the ground level, must be covered with an ant and damp-proof course of metal or bituminous felt. Galvanised sheet iron of 26 gauge is the more reliable, but felt has the advantage of being somewhat cheaper and easier to work. Where iron is used the strips should overlap each other by 6 ins., and each such joint should be carefully soldered. Lime mortar should not be placed in contact with the galvanised iron. The course immediately below it should, therefore, be laid in cement mortar in any case, and the one above it in either cement or dagga.

Walls.—The walls should be built to the dimensions shown on the drawing, all outside walls and the first 6 ft. of the partition walls being in 14-in. work and the upper part of the division walls in 9-in. work. The upper part of the division walls should be corbelled at intervals of two feet to support the tying sticks, and carried up beyond the roof to prevent the spread of fire. It may be noted here that no timbers should be carried through the division walls for the same reason. The end walls should be carried up in the same way for convenience in fitting the ventilator. All brickwork above the damp course may safely be laid in good dagga mortar, or, if preferred, a 1 in 5 lime mortar may be used. In the former case it is advisable to point all external joints with cement mortar after scraping out the dagga to a depth of one inch to give the pointing a good hold. Pointing with cement is sometimes applied to walls built in lime mortar, particularly in exposed situations. Particular care should be taken to run the walls up perfectly vertical.

Door Openings and Doors.—Either concrete lintels or brick arches may be built over the door openings. The latter are cheaper and quite easy to build. They should be constructed of two rings of brickwork laid on edge, set in cement mortar. The rise should be not less than one-twelfth of the span, *i.e.*, for an opening of 3 ft. the height of the centre of the arch should be 3 ins. The door frames should be placed in position when the walls are a few courses high and built in with the brickwork, to which they are secured

at intervals with hoop iron. The doors themselves can be cheaply made from 6-in. flooring secured by battens of the same material, as indicated in the drawing.

Roof.—Two roof principals constructed of 4½ in. x 1½ in. timber are required in each barn; these are secured to the walls by means of hoop iron built into the top six courses of brickwork. The roof covering consists of 7-ft. sheets of galvanised corrugated iron, secured to the purlins by screws and washers. The purlins should be set on edge and the screws driven through holes punched in the ridges of the iron and not in the valleys. Flashing of 26 G. galvanised iron must be fitted where the roof iron meets the projecting walls and chimneys, and should be secured by screws to the trimming timbers set flush with and at right angles to the purlins. Guttering and down pipes may be fitted if desired, in which case the water discharged therefrom should be led at least 4 ft. from the foundation by means of brick and cement drains.

Ridge Ventilators.—In the design of roof ventilator shown on the drawing the king posts of the principals are carried up approximately 12 ins. above the apex of the rafters, and to the top of these are attached by bolts or screws two lengths of 3.in. x 1½ in. timber running the full length of the roof to act as purlins. Midway between the king posts and at their ends these purlins are strengthened by distance pieces of 4½ in. x 1½ in. timber secured by ⅜ in. bolts. Ordinary stock ridging is secured to the upper edge of these purlins, to which the flaps are also attached by means of 10-in. "T" hinges. The flaps are made from 24 G. flat galvanised iron, the edges of which should be turned over on a length of stout fencing wire to give them the necessary stiffness. The flaps when closed rest against sills of 4½ in. x 1½ in. timber placed on edge above the top purlins, which are so spaced as to leave an effective opening of 12 ins. running the full length of the roof. The controlling cord or wire is attached to a light metal arm riveted to the centre of the flap, and may pass either directly over a pulley and down inside the barn or be led through a hole or notch in the sill and down over the iron to the ground. It must be protected from chafing on the edge of the iron or guttering by means of a pulley or smooth wooden block attached to

the fascia board. At each end of the roof and between the flaps a strip of roof iron a few inches wide must be carried well up under the ridge to prevent the entry of rain.

Furnaces.—The furnaces should be built of good selected brick laid in dagga mortar and pointed with cement. A set of fire bars should be provided for each furnace. The proper cast iron variety are undoubtedly the most durable, but they are rather costly, and a substitute can be made with light section rails, lengths of old tyre iron or small railway sleepers drilled at frequent intervals with $\frac{3}{4}$-in. diameter holes. Whatever fire bars are used, they should not be set more than $\frac{3}{4}$ in. apart, as otherwise a lot of the incandescent charcoal from which a large percentage of heat is derived will be lost in the ash pit. At one end they must be left free to allow for expansion. The ash pit floor should be at least 18 ins. below the fire bars, which otherwise will get excessively hot and soon burn out. In order to have the fire under proper control and to burn the fuel in an economical manner, it is necessary to provide doors to the fire box and ash pit; the latter may conveniently be in the form of a flap suspended by the top edge.

Several types of proprietary furnaces and furnace fronts are procurable on the local market, and if one of these is used the brickwork must be built to suit it. If, however, it is desired to dispense with these, a temporary expedient may be rigged up with odds and ends of sheet and angle iron, as the ingenuity of the builder may suggest. The drawing indicates the type of front recommended.

Flues.—The flues shown are of the circular iron type, which have proved highly satisfactory and are too well known to need further comment. They are now supplied locally in stock patterns, with or without an iron chimney, at a very reasonable price.

Inlet or Bottom Ventilators.*—An idea which will be new to a number of growers is shown in connection with the bottom ventilator, which, instead of opening direct into the barn, opens into a brickwork duct leading under the transverse flues. By this means all air admitted by the

* A modification of this idea has been adopted by certain prominent growers, with very satisfactory results.

ventilator is warmed by the flues before coming in contact with the tobacco. It is suggested by the Tobacco Expert that this should improve the curing, and it should certainly increase the general heating efficiency of the barn. The apertures in the outside wall may be fitted with a metal sliding shutter, or the ingress of air may be regulated by the insertion of loose bricks. The ducts themselves consist of two single brick walls four courses high, in which the flues are supported by pieces of light angle iron resting on the second course.

The walls are so spaced that a gap of approximately 1½ ins. is left between the flue and the walls. These gaps should be closed for a distance of about 2 ft. at either end by means of another course of brickwork laid actually touching the flues, so that the air is not released into the barn until it has travelled some distance in contact with the flue. The extension of the ducts between the ends of the flues and the wall of the barn may be covered in by a piece of thin sheet iron such as may be cut from a paraffin tin.

Where the flues installed are of the types having the end return sections inclined at an angle, the top of the duct walls should be built to follow, as nearly as possible, the angle of the flue.

Chimneys.—The builder has the choice of a brick or iron chimney, the advantage of the latter being that it is easily erected and can be readily cleaned. Its use also saves a good deal of time in building, which is often an important consideration. These may be purchased for about £4. A brick chimney should be built of 9-in. brickwork laid in good dagga mortar, the upper portion above the roof being reduced to 4½-in. work laid in cement mortar. The flue passage should be kept as smooth and straight as possible. An aperture should be left at the base of the shaft for convenience when cleaning. It can be closed by a metal shutter or with bricks left projecting slightly, so that they can be easily removed when necessary. A sheet iron damper for controlling the draught should also be provided.

Schedule of Quantities and Costs.—A schedule of quantities of the materials required for the construction of a block of four barns of both sizes is given.

In the majority of cases dagga will be used for laying the bricks, but the quantities of lime and sand are included for the convenience of those who intend using these materials; but it must be noted that the quantities used will vary considerably, according to the strength of the mixture and the thickness of joints.

The cost of bricks is not included, as it is assumed that these will be made on the farm, and the cost of production will vary considerably, according to local conditions.

The ironwork for the furnaces is another item for which it is difficult to give useful figures as to cost, and has therefore been omitted.

The costs quoted, which are based on average prices ruling in Salisbury to-day, are given as a general guide only and must not be considered in any way binding, as all such materials are subject to fluctuations of the market.

SCHEDULE OF QUANTITIES

for four Tobacco Barns 12 ft. x 12 ft. x 16 ft.

Item.	Material.	Number or Quantity	Size or Length	Total Quantity	Approximate Cost
				ft.	£ s. d.
Foundations (18in. deep)	Bricks	8,000	...	...	...
	Cement	16 bags	...	...	11 4 0
	Sand	5 cub. yds.	...	...	...
Walls	Bricks	44,500	...	...	...
	Lime	45 bags	...	...	13 10 0
	Sand	25 cub. yds.	...	...	...
Furnaces	Bricks	12,000	...	...	...
	Cement	2 bags	...	...	1 8 0
	Ironwork	...	...	...	...
Chimneys	Bricks	3,000	...	...	...
	Cement	2 bags	...	...	1 8 0
Flues	Circular, iron 11in. diam.	4 sets	...	...	40 0 0
Floors	Bricks	2,100	...	...	...
Warm air ducts	Bricks	1,600	...	...	...
Damp course	26-g. flat gal. iron	16 sheets	6ft. x 3ft	...	3 16 0
Door frames	Uprights, deal, 3in. x 3in.	8	7ft.	56	1 2 0
	Rails, deal, 3in. x 3in.	4	3ft. 6in.	14	0 6 0
Doors	Flooring, 6in. x ⅞in.	24	6ft. 6in.	156	1 19 0
	Battens, horizontal	12	3ft.	36	0 9 0
	Battens, diagonal	8	4ft.	32	0 8 0
	T hinges	8	12	...	0 12 0
	Tower bolts	4	8	...	0 6 0
Wall plates	Deal, 4½in. x 1½in.	8	13ft.	104	1 8 6
Roof principals	Tie beams do.	8	15ft.	120	1 12 6
	Rafters do.	16	8ft.	128	1 15 0
	King posts do.	8	5ft.	40	0 11 0
	Struts do.	16	4ft.	64	0 17 6
	Ventilator sills do.	8	13ft.	104	1 8 6
Purlins	Deal, 3in. x 2in.	24	13ft.	312	3 18 0
Purlins for ventilators	Deal, 3in. x 1½in.	8	13ft.	104	0 19 6
Trimming timbers	Deal, 3in. x 2in.	16	7ft.	112	1 8 0
Ridging	Galv. iron, 18in. wide	9	6ft.	...	1 7 0
Ridge ventilators	Flaps, 24-g. flat galv. iron	8 sheets	6ft. x 3ft.	...	2 8 0
	T hinges	48	10in.	...	3 0 0
	Bolts, 8in. x ⅝in.	28	...	...	0 7 0
	Actuating arms, iron, ⅝in. x ⅛in.	16	2ft.	32	0 3 6

Item.	Material.	Number or Quantity.	Size or Length.	Total Quantity	Approximate Cost.
				ft.	£ s. d.
Roof covering	24-g. galv. corrugated iron	56 sheets	7ft.	392	12 5 0
	Screws & washers	3 gross	...	...	0 13 6
	Flashing, 26-g. flat galv. iron	9 sheets	6ft. x 3ft.	...	2 2 9
Fascia	Flooring, 6in. x ⅞in.	4	10ft.	40	0 10 0
	Flooring, 6in. x ⅞in.	4	12ft.	48	0 12 0
Tiers	Main bearers, 6in. x 3in.	4	13ft.	52	2 3 3
	Vertical supports, 3in. x 3in.	8	9ft.	72	1 8 6
	Cross members, 4½in. x 1½in.	40	13ft.	520	7 1 0
Guttering and down pipes	...	...	...	...	8 0 0
Miscellaneous	Hoop-iron, nails, screws, etc.	...	...	...	4 0 0
Total					136 8 0
or Total, exclusive of lime, guttering, down pipes and tiers ...					104 5 3

SCHEDULE OF QUANTITIES

for four Tobacco Barns 16 ft. x 16 ft. x 20 ft.

Item.	Material.	Number or Quantity.	Size or Length.	Total Quantity	Approximate Cost.
				ft.	£ s. d.
Foundations (18in. deep)	Bricks	10,200	...	...	...
	Cement	20 bags	...	...	14 0 0
	Sand	6 cub. yds.	...	...	...
Walls	Bricks	75,000	...	...	...
	Lime	75 bags	...	...	22 10 0
	Sand	42 cub. yds.	...	...	...
Furnaces	Bricks	12,000	...	...	...
	Cement	2 bags	...	...	1 8 0
	Ironwork	...	...	...	...
Chimneys	Bricks	3,500	...	..	...
	Cement	3 bags	...	...	2 2 0
Flues	Circular, iron 11in. diam.	4 sets	...	...	50 0 0
Floors	Bricks	3,500	...	...	...
Warm air ducts	Bricks	2,000	...	...	...
Damp course	26-g. flat gal. iron	20 sheets	6ft. x 3ft.	...	4 15 0
Door frames	Uprights, 3in. x 3in.	8	7ft.	56	1 2 2
	Rails, 3in. x 3in.	4	3ft. 6in.	14	0 5 7
Doors	Flooring, 6in. x ⅞in.	24	6ft. 6in.	156	1 19 0
	Battens, horizontal	12	3ft.	36	0 9 0
	Battens, diagonal	8	4ft.	32	0 8 0
	T hinges	8	12in.	...	0 12 0
	Tower bolts	4	8in.	...	0 6 0
Wall plates	Deal, 4½in. x 1½in.	8	17ft.	136	1 16 10
Roof principals	Tie beams do.	12	19ft.	152	2 3 0
	Rafters do.	24	11ft.	264	3 11 6
	King posts do.	12	7ft. 6in.	89	1 4 0
	Struts do.	24	6ft.	144	1 19 0
	Sills for ventilators do.	8	17ft.	136	1 16 10
Purlins	Deal, 3in. x 2in.	24	17ft.	408	5 2 0
Purlins for ventilators	Deal, 3in. x 1½in.	8	17ft.	136	1 5 6
Trimming timbers	Deal, 3in. x 2in.	16	10ft.	160	2 0 0
Ridging	Galv. iron, stock	12 lengths	6ft.	...	1 16 0
Ridge ventilators	Flaps, 24-g. flat galv. iron	12 sheets	6ft. x 3ft.	...	3 12 0
	T hinges	64	10in.	...	4 10 0
	Bolts	36	8in. x ⅜in.	...	0 9 0
	Actuating arms, iron, ⅜in. x ⅛in.	16	2ft.	32	0 3 6
Roof covering	24-g. galv. corrugated iron	72 sheets	10ft.	720	25 10 0
	Roofing screws and washers	4 gross	2½in.	...	0 18 0
	Flashing, 26-g. flat galv. iron	12	6ft. x 3ft.	...	2 17 0

Item.	Material.	Number or Quantity.	Size or Length.	Total Quantity	Approximate Cost.
				ft.	£ s. d.
Fascia	Flooring, 6in. x ⅞in.	4	17ft.	68	0 17 0
	Flooring, 6in. x ⅞in.	4	15ft.	60	0 15 0
Tiers	Main bearers, 6in. x 3in.	4	17ft.	68	2 16 8
	Vertical supports, 3in. x 3in.	12	13ft.	156	3 1 9
	Cross members, 4½in. x 1½in.	84	17ft.	1,428	19 6 9
Guttering and down pipes	...	...	...	...	10 0 0
Miscellaneous	Hoop-iron, nails, screws, etc.	...	...	...	5 0 0
Total					201 18 1
Total, exclusive of lime, tiers, guttering and down pipes ...					144 2 11

NOTES ON BUILDING THE 16 ft. BARNS.

As previously stated, the larger sized barns (16 ft. x 16 ft. x 20 ft.) may be built to this design, which to a certain extent supersedes that given in the issue of the *Rhodesia Agricultural Journal* for August, 1926, and reprinted as Bulletin No. 605. The chief points of difference from the smaller type are as follows:—

The ground plan dimension of each barn will be increased to 16 ft. each way, and height to the eaves or the top of the side walls will be increased to 20 ft. The height of the chimney will be increased accordingly.

The size of the furnace will remain unaltered, but the larger flues will be required.

The roof principals, three of which will be required in each barn, will be of the same pattern, but correspondingly larger.

The bottom ventilating arrangement will remain the same.

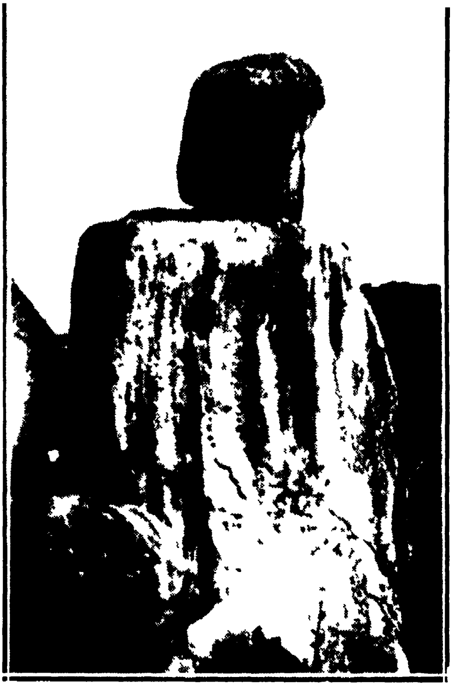
Three vertical tier poles will be necessary, and these will be long enough to support two additional cross members.

Labour-saving Machinery.

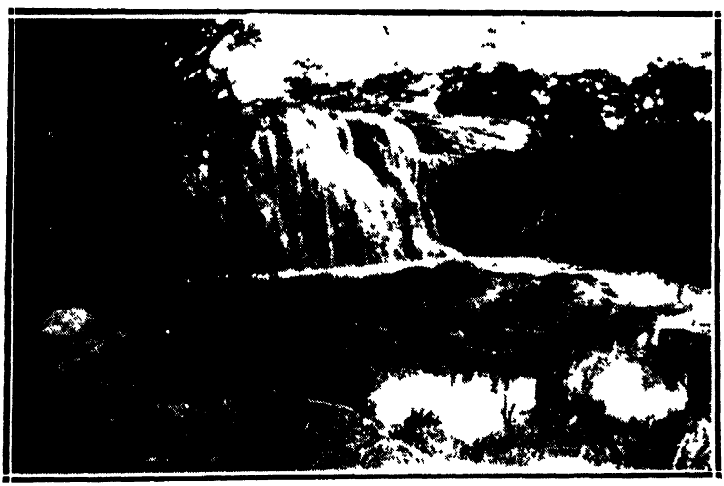
By "LABOUR SAVER."

Nearly every week one sees reports of farmers' meetings requesting the Government to undertake experiments with labour-saving machinery, etc., but no mention is made of what particular devices are required. Practically all the labour-saving machinery invented is obtainable in Rhodesia and South Africa, or would be obtainable if a demand existed for it. Beyond organising field trials and inviting agents to demonstrate their various implements, I do not see that the Government can do very much. Farmers can hardly expect the Government to invent machinery for them. I believe that if farmers would write to the *Rhodesia Agricultural Journal*, giving some idea of what particular machinery or labour-saving device they require, they would probably find that some farmer was using or knew of the very thing wanted, or if not in existence, it might develop the inventive genius of someone to provide it. Corresponding with a farmer about some machinery, I happened to mention that I found a certain implement very useful. Replying, he informed me that he knew of the implement, and mentioned that a ridging and fertiliser attachment for tobacco could now be obtained for this implement. This was valuable information to me, as I had not heard of it before.

There are very many small labour-saving devices, the adoption of which would help to economise labour. In detail they appear trivial, but in the aggregate are very valuable. If I want water or liquids carried I provide a yoke, and the native carries two buckets or tins easier than he would carry one, yet so few adopt this device that the native considers carrying one tin at a time is a fair thing. Take hay



Rumani rock near Salisbury



Picturesque Rhodesia.
Falls on the Munenga River, 17 miles from Salisbury, on Rumani Farm (Mr. L. Vereker).

or litter carrying and carting: a light, easily removable top or extension on a wagon enables three or more times as much to be carried, yet they are not in general use. Time-saving devices are also labour-saving, yet most farmers stick to the old yoke for oxen. Some ten years ago I obtained some patent yokes that are still in use, with no expense for repairs having been incurred. Having fixed metal skeys and chains instead of strops, inspanning takes very much less time and there is no expense for strops or time lost in making skeys. Some farmers have boys constantly employed carrying and carting water. A pump would often eliminate the natives, give a better water supply and be cheaper. One sees manure being carted with wagons and laboriously spread, yet scoops and manure spreaders are an old invention.

The greatest economy in labour can often be effected by having a farm properly laid out. In the old days, when labour was plentiful and also cheap, farms were not laid out with a view to saving labour; buildings, etc., just happened. Those farms to-day use much more labour than they should do. Look at the lay-out of lands on some farms and the time and labour required in working those lands, moving the implements from place to place, etc. Many homesteads are built on kopjes, with dairy, stores, garden, etc., down below. All household requirements have to be man-handled up; every time anything is wanted from dairy, stores or garden, time and labour are wasted in going up and down. To change these conditions on existing farms would often prove too expensive, and the old labour-wasting methods have to go on; but with farms in the making such conditions should not be perpetuated. Even on old farms much could be done by careful planning and adopting simple labour-saving devices.

New settlers are prone to follow the old examples, and it should be the aim of the Department of Agriculture to give as much assistance as possible to prevent this. A few years ago a new settler decided to build in a certain place, and came to me for advice. I went thoroughly into the matter with him, and showed that by putting his homestead in another place he would save nearly £100 a year in labour and expenses. He took my advice, and later on, when labour became scarce, informed me that had he carried out his

original ideas he would not now have been able to get enough labour to carry on with. Visitors to my farm are quite unable to believe that it is run on the small number of natives that I employ, and I have to go round with them to point out where the labour saving comes in. The best way of saving labour is to lay out the farm with that idea in view, and then to adopt such labour-saving devices available in the form of suitable equipment.

Right under his hat the farmer has one of the finest labour-saving devices ever invented. A little more use of this device would greatly assist to alleviate the labour shortage.

Poultry Husbandry.

TEMPERAMENT.

By A. LITTLE, Poultry Expert.

The temperament of a hen or duck affects largely the production of eggs, the fertility, the hatchability and the quality of the chicks or ducklings. The temperament of the male also has a bearing on the last three mentioned points. This to a layman, and also to many poultry-keepers, may seem far-fetched, but it certainly is the case, as I shall endeavour in this article to prove.

Any poultry-keeper who handles or observes his fowls carefully will have noticed that the best layers are always friendly and docile, those that talk to one; they are quiet, easily handled and follow one about. Often when going into a pen or walking past it the whole of the birds may run towards one; this is not necessarily friendliness and docility, but is often due to lack of food and is quite a different matter. One knows then that the owner is not giving the attention to his birds that he should. The good layer enters the trap-nest, quietly lays her egg and also quietly stays there till released. The poor layer enters noisily, and when she has laid, struggles to get out and raises her voice unnecessarily. It is chiefly when grading and handling that the temperament of a fowl can be noted. The docile bird—that is, the good one—will rest quietly in one's hand—that is, of course, if it is properly handled; it will croon and talk to one, peck one's buttons and generally be very friendly. The poor layer will, on the other hand, no matter how gently handled, raise its neck hackles, struggle and will show bad temper. It will be nervous and highly strung, and should be graded out at once. Neither

is the mopish hen nor the one that the male bird is apt to bully a desirable bird to keep.

The eye is a most important point in judging temperament. In the bad layer the eye lacks fire and character. She also has a sad-looking face and puffed eyelids and usually a worried expression. In the good layer the expression is the reverse. We have all also seen the friendly, docile, good-tempered look in the eye of a horse or a cow and other animals. A good opportunity to observe the different temperaments of fowls is at a show. If one opens the pen door and waits for a few seconds, the good-tempered bird comes towards the open door and her good temper, docility and friendliness can be plainly seen; on the other hand, the bad-tempered bird, which is the poor producer, will ruffle the neck hackle and will fly round the pen, squeal and refuse to be caught. There is also the medium-tempered bird, which with a little coaxing may be tamed and settle down. However, such a bird is not one I should recommend breeding from, but she is good enough to keep for laying.

It would be as well to make a slight digression here and say a few words upon the handling of fowls. Many do not know how to handle a bird properly. They do so roughly, and any bird, even the friendly, sweet-tempered, docile one, will not stand such treatment without objecting and being frightened. Other people again run round madly after the birds and lose their tempers; they will never get the best results from their fowls and will very likely spoil the temperaments of the most contented, docile birds. I have seen docile, friendly birds which have followed their owners round the pen into the house shooed or kicked away because they were considered a nuisance. Such people should never keep fowls; they look upon them only as money-makers, and have no interest whatever in them otherwise. The fowls themselves enjoy the company of the considerate, kindly, interested owner, but not the reverse, therefore all birds must be handled gently. It is a case of making or marring the best of birds, having a good egg production or a poor one, and good profits or poor ones. A fowl likes to have a quiet, easy time, *i.e.*, she does not like to be bullied by other fowls. The majority are of a very contented frame of mind and lay much better when quiet and undisturbed, and this accounts for the fact that birds in single pens—of course,

everything else being equal—produce more eggs than they would if they were in a pen of six or eight, and those in a pen of six or eight will produce more than if there were 100 in the pen. In every laying test where single pens and pens of four, five or six birds are the rule the highest individual records will be found among those birds in the single pens.

Nervous, highly-strung birds in a breeding pen always upset the others and worry the docile, contented ones, therefore they should never find their places in it. We know ourselves how fussy, highly-strung or contentious people get on the nerves of others in a company, even for the short period they may be together. How much more so is it the case where the fowls are always together day and night. Naturally the egg production and health of the usually contented, docile, good layer are reduced.

For the best production and hatching results the birds in the breeding pen should be all a happy family and kept in a quiet place, free from any disturbance.

Some birds are not only highly strung and nervous, but also have nasty tempers. They bully and scrap with the others; they upset the others, reduce the egg output, the fertility and the hatchability of the eggs, and should never have a place in the breeding or laying pens; their place is in the pot. Such birds also that are quarrelsome, ready to fight and always trying to "boss" their companions are in 99 cases out of 100 themselves low in capability—that is, capacity for producing eggs. Many will say that training, handling and being used to seeing people make for docility. They do to a slight extent, but on the really highly-strung, nervous, bad-tempered fowl they have little or no effect. The nervous or highly-strung bird will lay 50 or 100 eggs—probably not more—according to her environment, whereas on the docile, sweet-tempered one environment has not much effect—her temperament carries her through. She may lay her full quota or perhaps 250 eggs under most conditions, but probably 300 if environment is suitable. Even among breeds that have the reputation of being wild and flighty there are many docile ones.

How often do we find a bird that, when the attempt is made to stroke it as it sits on the perch, raises its neck

hackle, squawls and flies off with a rush, or, when eating, runs away if another bird comes near it, or out of the nest if another bird looks at it. She should at once be graded out and not kept either for breeding or laying.

When selecting birds for laying it is possible to do so with a good degree of accuracy after dark. If one goes into the house when the birds are on the roosts, with just a sufficient light to see dimly, the good layers can be picked out by passing the hand over each bird. Those that keep still and quiet under one's touch will be found to be the best layers in the flock. Any that get fidgety, raise their neck hackles, squeak or try to fly off the perch will be found to be poor layers.

The docile, good-tempered bird usually lays and moults at the same time; the highly-strung, bad-tempered one suddenly stops laying and goes into a full moult. Many birds, as we know, go into a neck hackle moult for some reason or other; others for the same reason (it may be change of food or change of quarters) go into a full moult instead of a neck hackle one. The latter will be found to be the nervous ones, the former the docile ones.

The nervous, highly-strung temperament is handed down in nine cases out of ten to the progeny from the sire or dam. The eye, as mentioned previously, is a very good criterion of this quality of docility and an even temperament. In this case it is bold and kindly-looking, high in the skull and prominent, the pupil is large and the iris bright. On the other hand, in the highly-strung, nervous or bad-tempered bird there will always be a frightened look in the eye, the pupil will be small and the eye often sunken. The same applies to the male. We have highly-strung, bad-tempered ones, which are no good in the breeding pen or anywhere else, except in the pot; on the other hand we have the friendly, even-tempered ones, which are the birds to breed from. One should be chosen that will talk, crow when being held in one's hand, that is gallant to his hens and calls them to food, or goes into the nest and calls them to it, talking and chirruping to them. The bird that shows fight when he should—*i.e.*, when anyone interferes with his wives or when another male comes near them—is the one to be selected. The male that ruffles his hackle, pushes his

head out of the way when handled, squeals if caught, shows a frightened expression in his eye or spends a good part of his time in a quiet corner or on the perch, out of the way of other males, should never be chosen for the breeding pen; any amount of training has little or no effect on such birds.

Ducks.—The same observations apply equally to ducks. There are many that are docile and friendly and easy to handle; but, taking them on the whole, they are rather more nervous than fowls and resent the presence of a stranger. The same person should always look after and feed them, and the attendant's movements when doing so should be quiet and deliberate; any fussing or quick action upsets them, the result being fewer eggs and often bad hatching results. The proper management of ducks means a lot to their owners, for they respond remarkably readily to kindness and a quiet, friendly attitude.

Docility is quality.

The docile bird is the good laying one.

Temperament plays a very large part indeed in egg production, fertility of eggs and vitality of chicks.

Bee-Keeping in Rhodesia.

SWARM CONTROL.

By T. Savory.

Swarming has been described as the natural instinct of the honey bee for increase, and such it actually is. In spite of the greater knowledge we now have regarding the habits of bees, "swarm prevention" is probably the greatest of all apiarian problems.

In the wild state swarming may be said always to be the outcome of congestion. The queen and worker bees having filled up all available room, space has to be found by the natural means of what is known as swarming. Thus the queen and a certain portion of the hive inmates issue forth to find and establish a new home, leaving enough new queen cells in the old one to hatch out other queens, which will either issue forth as extra or "cast" swarms or remain in the hive after one has obtained supremacy and after having been duly mated during her first flight.

There are other reasons for swarming. It is bound to take place under any of the following conditions:—

1. When a single brood chamber is filled with eggs, brood, young bees and honey and there is no more room for the queen's life work of egg-laying, bringing to the colony a sense of much strength and a requirement for expansion.

2. When the hive is uncomfortable, out in the hot sun all day, without any shade boards, and perhaps with an entrance altogether too small.

3. When the colony is weak and badly nourished. The bees will not be able to keep up the temperature required in the hive, and under such condition a new home is sought.

4. Want of food. Bees can neither live nor rear the brood without ample food, and a starved swarm will take its only remedy by getting fresh quarters.

5. An ageing and failing queen. As soon as a queen shows a weakening of her powers the inmates are quick to note it, and start getting ready to supersede her by a new one by forming queen cells—the beginning of an early end.

6. Lack of or bad ventilation. This is perhaps one of the most usual causes, next to the congestion of the brood chamber. Here once more the slogan of the apiarist, "Watch your hives," may easily save him several of his colonies.

Congestion of Brood Chamber.—If an examination of the brood chamber be made every week or ten days the owner should know exactly how the filling up of it in eggs, brood and young bees is progressing. As soon as the greater portion is seen to be occupied, a second chamber of deep or shallow frames should at once be added, and for the wild or Rhodesian bee the shallow frame will as a rule be ample. If swarming is due to congestion, then naturally more room must be given. The double brood chamber has of recent years been generally recognised by the large majority of American bee-keepers as a main preventative or control of swarming, and it is being universally adopted. The writer has followed this plan for the last two years, with remarkable success.

An Uncomfortable Hive.—The hive must have shade from the blazing mid-day and afternoon sun. Two hives on a 4-ft. stand require but one shade board, as one will assist the other. This board can be formed by elongating one side of the roof on the sunny side, while if they are in an apiary as described in the February *Journal*, the natural shade there shown will be all that is required. The colour of the hive also helps. Green, khaki or white are the only ones that should be used, and are not only acceptable to the bees, but also resist the sun's rays considerably.

Entrance is another point to consider, and has much to do with the comfort of the hive. Throughout the summer

it should run the entire width of the hive and at least half an inch deep. If it is too large the workers will quickly reduce it by building pillars of propolis to suit their wants. Each hive at the outset should always be provided with stops or closers, one on either side, ready to reduce or increase the entrance, as required. Frame "starters" are also a source of much trouble to the bees, and only frames of full foundation should be given, while even some of these should be given up where it is possible in favour of some fully drawn out combs. This removes every obstruction to the immediate starting of the real work of the colony—in other words, making it simple for the bees to begin their life's work. A swarm hived on "starters" is pretty sure to abscond; it is less likely to do so on full sheets. If hived on several full combs, it never will.

A Weak and Poorly Nourished Colony.—This should never occur in any up-to-date apiary. If it should, see that it is united with another before going into winter quarters, or indeed at any time. If this is not possible it will form a case for feeding, as described in the last issue of this Journal. Keep all colonies strong at all times of the year; it is simple and easy enough to do so. An article entitled "Uniting and Reducing" will shortly appear in this Journal.

Want of Food.—The double brood chamber will as a rule always provide a remedy for this, but no one worthy of the name of a bee-keeper has any right to have a single colony in this condition, unless it may be under certain conditions of the weather or season that may once and again occur and which no one can foresee.

An Ageing and Failing Queen.—The average life of a queen bee is from two to three years. Many owners of large apiaries make a point of re-queening each year; others keep them for two years; while some, for very especial points that the colony may show, will keep a queen for her third year. The two-year period of usefulness and conditions probably apply in particular to the Rhodesian wild bee.

As soon as there is any sign of failing powers in the queen, the bees instinctively feel that something is wrong, and at once begin preparations for rearing one or more new

ones. When it is desired to end her services there are two ways of doing so. As soon as any one queen has reached the age of two years, search for and destroy her, substituting another in her place. This (which is known as "introducing") and the general subject of re-queening is a considerable item in itself and will be dealt with later on. Suffice it now to say that though it requires special knowledge, it is an easy enough process when once acquired.

Another plan, and certainly a simpler one, is by what is known as "uniting"—already referred to—*i.e.*, making two colonies into one, when probably the younger and more agile and virile queen will fight it out with the other; in any case, the survival of the fittest will be the result. This also will be dealt with later on under the same heading.

The more generally accepted and adopted plan amongst apiarists is to rear their own queens and substitute another as occasion may require. This, however, is a special branch of bee-keeping and cannot be dealt with at present. In the meanwhile the foregoing details should be enough for the beginner—at least, for the coming season.

Lack of or Bad Ventilation.—This is always a source of much discomfort to the bees, and will often cause swarming without other leading causes. There should, throughout the entire hot season, be both top and bottom ventilation: from the top by means of an inch deep frame of mosquito wire gauze, and from the bottom by the regulated entrance closers. Extra ventilation can always be provided by wedging up the brood chamber from the floor, and the top supers can also be wedged apart as required. During a honey flow bees need much more ventilation, as they are then more active than at other times. A favourite American plan is to bore a one-inch hole at each end of the top super; these are covered over with netting and closed when required by a slide, or the super over the brood chamber may be slid along it far enough forward to form an opening at the back for ventilation. With due care to the foregoing, and provided the apiary is not located in a hot nook where there is but little air circulation, swarming from this cause need not be feared.

As an instance of the urgency of dealing with the subject of this article it might be mentioned that the United

States Department of Agriculture have recently issued a brochure of 47 pages entitled, "Farmers' Bulletin; Swarm Control." It is well illustrated, and every line of it is pregnant with valuable information on this subject, and it should be in the hands of every up-to-date bee-keeper. While it states that "the one factor which is universally present in normal swarming is that of a congestion of bees within the brood nest," it goes on to add, "other factors often mentioned as causing swarming are not universally present," and with those factors it deals most thoroughly in all their points. Suffice it to say that it sums up the "swarm-preventative measures," to the number of 13, short and to the point. These should be copied out and hung up in the workshop of every bee-keeper in the two Rhodesias.

It may perhaps serve as a point of interest, bearing out the advantage of double brood chambers, to state that the writer put his 22 colonies into winter quarters last April on a double brood chamber to each, with ample food as far as 18 hives were concerned, the other four being of the "Long Idea" pattern, of which more anon, all 22 coming out the last week of August brimful of bees, with ample reserves of food left over and all of the colonies in active work on both eggs and brood, without any signs, as far as he could find, of queen cells or other signs of swarming from any one hive, most of the queens being in their second year.

Co-operative Marketing by American Farmers.

The subject of co-operative marketing occupies a prominent place in the report of the U.S. Secretary of Agricultuie for the year 1926. Its consideration goes hand in hand with that of another urgent problem—the problem of agricultural surplus. To the solution of this latter problem there are two lines of approach—one through a better adjustment of production to market requirements, the other through marketing. In the opinion of the Secretary of Agriculture, the second avenue is the more promising, and he believes that an orderly flow of products to market can best be effected by farmer-controlled agencies. Legislative action, he says, should be designed to create and enlarge such agencies and supplement their efforts. Every region and every commodity has its special marketing problems, and co-ordinated effort backed up by adequate funds is needed. A number of recent laws have been directed to the marketing of farm products. The U.S. Warehouse Act, for instance, gives to the farmer a warehouse receipt for his stored products which is everywhere recognised as sound collateral security for loans, and the Intermediate Credit Banks are extending credit to organised farmers.

Organisation, both local and regional, is imperative. Still more credit is needed, and if, in addition to that, funds are available to make advances to co-operative associations, these would be enabled to carry surplus production from one season to another. The individual farmer would have the money for his products, but would not lose control of them.

A large-scale efficiently managed co-operative can effect three fundamental improvements in the marketing of farm produce: (1) It can standardise grades and handling methods; (2) it can develop an effective merchandising programme; (3) it can give the farmer information which will enable him to visualise market conditions six months or a

year in advance, and thus assist him in making adjustments in his production plans.

In dealing with what he calls the pitfalls of co-operative marketing the Secretary of Agriculture mentions that failures in co-operative marketing have not been unusual. In 1923 they amounted to 1.9 per cent. of all associations reporting to the department, but in 1925 failures only amounted to 0.3 per cent. of the more than 10,000 co-operative associations which reported in that year. The failure of co-operatives which had gone out of business has been traced in most cases to a few well-defined causes. Chief of these is failure to obtain a sufficient volume of business to make economical and official operation possible. This may be due to unwise selection of the field of operations or to poor management. A serious weakness to many co-operatives is found in the tendency of members of the board of directors to shirk their responsibilities. Changes in economic conditions too may seriously interfere with the operations of co-operative associations. Thus the shifting of the demand from cigars to cigarettes has seriously embarrassed tobacco marketing associations in the cigar-leaf districts; again, co-operative creameries have had to close down because the growth of towns in the neighbourhood opened up a demand for fresh milk. On the other hand, the associations which have been successful owe this to the superior service they have been able to render rather than to the arbitrary fixing of prices.

By an Act passed in 1926 a division of co-operative marketing in the Bureau of Agricultural Economics was set up. It is designed to enable the department to conduct research studies and to furnish service which will aid in the development of the co-operative movement. The division is at present studying the co-operative marketing of various commodities—cotton, grain, live stock, milk, fruit and vegetables. The Act which set up the division also makes possible the employment of specialists who are familiar with co-operative marketing and with the problems of particular commodities. These men will have two functions: first, to collect statistical and other information made available by the Department of Agriculture and other agencies, and disseminate it to the co-operatives in such a way as will be most useful; and secondly, to outline and assist in the

marketing research and service required by the co-operative associations.

The department hopes to be able to assist colleges and other institutions which may organise courses of instruction in co-operative marketing. The fact that an increasing number of persons are anxious to follow these courses shows that they are popular.

The 1926 Act, while designed to promote and foster co-operation, does not hand over to the department the regulatory control of the associations to any degree. It has never been the department's policy to attempt to seek any such control, neither does it intend to take upon itself any of the functions which the co-operative associations themselves are expressly organised to perform. The work of the department will be confined to those research, educational and service activities which it is peculiarly fitted to perform, and it will be guided in this work by the developing needs of the co-operative associations.—(*Journal of Department of Land and Agriculture*, Ireland.)

Movements of New Settlers.

The following new settlers arrived in this Colony during the month of September, 1927:—

A. Aamodt.—Arrived from Denmark on 2nd September, and joined Mr. K. Hansen, Dedsi, Sinoia, for training.

O. P. Gilpin.—Arrived from Great Britain on 2nd September, and joined his brother at Umvuma.

J. Mungle.—Arrived from Great Britain on 2nd September, and joined his brother at Odzi.

D. F. Duigan.—Arrived from Northern Rhodesia on 2nd September, and has settled at Bromley.

W. D. Willis.—Arrived from New Zealand on 2nd September on tour of inspection.

G. T. Evans.—Arrived from Great Britain on 6th September, and joined Mr. F. M. Waite, Darwendale Estate, for training.

R. N. R. Ball.—Arrived from Great Britain on 7th September, and proceeded to Mrs. McAllister, Woodenhove, Lalapansi, for training.

G. Bryson.—Arrived from Great Britain on 7th September, and went on visit to Mr. E. S. White, Concession.

Mr. and Mrs. A. C. Baldwin.—Arrived from Great Britain on 7th September, and have been temporarily accommodated on Government Experiment Station, Salisbury.

Peach Bros.—Arrived from the Union on 7th September on tour of inspection.

Messrs. Manning and Nethling.—Arrived from the Union on 7th September on tour of inspection.

R. S. Muir.—Arrived from Kenya on 7th September on tour of inspection.

E. Huggan.—Arrived from Great Britain on 8th September, and joined Mr. Murgatroyd, Brantwood, Plumtree, for training.

S. G. Laurie.—Arrived from Great Britain on 9th September, and proceeded to Mr. L. S. Myring, Concession, for training.

R. K. Parker.—Arrived from Great Britain on 9th September, and joined Mr. H. E. S. Scott, Folkington, Inyazura, for training.

E. J. Pittock.—Arrived from Great Britain on 9th September, and proceeded to Mr. W. E. Bouette, Banket, for training.

C. F. Pullen.—Arrived from Great Britain on 10th September, and joined Mr. G. A. Dobbin, Omeath, Umvukwes, for training.

Mr. and Mrs. R. D. Kelly.—Arrived from Great Britain on 11th September, and proceeded to Mr. B. J. Ingle for a period of training.

V. Brereton.—Arrived from the Union on 13th September on tour of inspection.

G. R. Weber.—Arrived from the Union on 13th September on tour of inspection.

H. R. Duxbury.—Arrived from the Union on 13th September on tour of inspection.

A. I. G. Trimmer.—Arrived from Great Britain on 15th September, and proceeded to the Mazoe Tobacco Estates, Ltd., for a period of training.

H. Spalding.—Arrived from the Union on 15th September, and proceeded to Messrs. Curson Bros., Macheke, for training.

R. L. Freer.—Arrived from the Union on 15th September on tour of inspection.

J. F. Hodge.—Arrived from Union on 15th September on tour of inspection.

R. J. Fuller.—Arrived from Union on 16th September, and visited friends in the Victoria district.

T. B. Simpson.—Arrived from Union on 16th September, and proceeded to Mr. J. O. Gibson, Berea, Salisbury.

T. R. Stock.—Arrived from Great Britain on 17th September, and proceeded to Col. Hodgson, Dormervale Estate, Marandellas, for training.

N. B. Stirrup.—Arrived from Great Britain on 19th September, and joined Messrs. Austin and Good, Mazoe Agricultural Estate, for training.

N. C. Skinner.—Arrived from Union on 19th September, and joined friends at Que Que.

J. H. Drake.—Arrived from Union on 19th September on tour of inspection.

Capt. C. G. Arkwright.—Arrived from Great Britain on 20th September, and proceeded to Capt. English, Lushington, Marandellas, for a period of training.

F. C. Paige Smith.—Arrived from Great Britain on 23rd September, and proceeded to Mr. W. J. Ruston, Chudleigh, Marandellas, for a period of training.

P. E. Young.—Arrived from Union on 23rd September on tour of inspection.

C. J. L. Sherrin.—Arrived from Great Britain on 27th September, and went to Messrs. Everard and Frank, Inyazura.

F. W. Wynne.—Arrived from Great Britain on 27th September, and joined his brother at Bita, Marandellas.

C. F. Platt.—Arrived from the Union on 28th September, and joined Mr. A. N. Gilchrist, The Warren, Salisbury, for training.

W. T. Seymour.—Arrived from Great Britain on 28th September, and joined Mr. M. C. Myres, Mt. Arthur, Marandellas, for a period of training.

T. R. Anderson.—Arrived from Great Britain on 30th September, and proceeded to Mr. G. N. Winskill, Msonza, Darwendale, for training.

S. W. Chell.—Arrived from Great Britain on 30th September, and proceeded to Mr. T. H. Chappel, Haighton, Banket, for training.

C. F. Thomson.—Arrived from Great Britain and joined Mr. J. Templeton, Banket, for a period of training.

M. McGarry.—Arrived from Great Britain on 30th September, and visited friends near Banket.

Southern Rhodesia Veterinary Report.

August, 1927.

AFRICAN COAST FEVER.

Bulawayo District.—The position in regard to Coast Fever is satisfactory, the mortality being only four during the month. Essexvale 2, Matopo Reserve 1, Longfield 1.

There have been no cases at any of the other infected centres.

ANTHRAX.

There was a further mortality of 13 head at Sandown North, Bulalima-Mangwe district, and one in the Ntabasinduna Reserve, Bubi district.

QUARTER EVIL.

Considerable mortality reported from the Salisbury, Gwelo and Bulawayo veterinary districts.

HORSE-SICKNESS.

Three cases in Bulalima-Mangwe district.

TRYPANOSOMIASIS.

Cases have been reported in Darwin and Hartley districts and one in South Melsetter.

TUBERCULOSIS.

Six bulls and 22 cows were tested on importation, with negative results.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 7; cows, 75; horses, 45; mules, 18; donkeys, 204; sheep, 1,233; goats, 671.

EXPORTATIONS (CATTLE).

To the Union of South Africa:—For consumption in Union, 955; for overseas export, 237. To Belgian Congo:—For slaughter purposes, 2,623. To Portuguese East Africa:—For slaughter purposes, 150; trek oxen, 134.

EXPORTATIONS (MISCELLANEOUS).

To Belgian Congo:—Pigs, 139.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

SEPTEMBER, 1927.

Pressure.—Barometric pressure during the month was about normal, varying from .032 in. below normal at Livingstone to .042 in. above normal at Umtali. The range during the month was small and the curve for the month is very similar to that for September, 1922 and 1924.

Temperature.—The mean temperature for the month was below normal, varying from 1° F. above normal at Gwelo to 3.3° F. below normal at Gatooma. The mean day temperatures were about normal, varying from 8.1° F. above normal at Tuli to 5.5° F. below normal at Sipolilo. The mean night temperatures were below normal, varying from 6.4° F. below normal at Tuli to 1.6° F. above normal at Sipolilo. Juliasdale recorded 7° F. of frost on the 4th of the month. It is interesting to note that slight frosts were recorded on the 6th, 7th and 9th of October at Inyanga.

Rain.—Scattered showers were reported from various stations during the month.

Local Weather Notes.—The following local weather notes have been supplied by observers:—

Zone B.—

Mazunga.—

The month was dry. The rain that fell on the 26th was very patchy; .37 in. was registered at station. Rivers still dry. Wind persistent from south-east and east.

Plumtree.—

As to be expected, there has been a steady rise in temperature throughout the month. Signs of early rain disappeared after the thunderstorm on the 26th. In Plumtree

there was a steady rain for half an hour, accompanied by thunder and lightning. The bulk of the rain apparently fell in the neighbourhood of Tsessebe, where pools remained on the roads for two or three days afterwards. A great many of the flower-bearing trees are now in full blossom, and new grass is appearing in vlei land.

Matopos Estate.—

Water in the rivers is beginning to dry up. The Maleme is no longer flowing near the nursery, and the pool there is rapidly dropping.

Zone C.—

Salisbury.—

The pressure during the month was slightly below the average. Three highs and two lows were experienced during the month, but none of these was severe. There was no rain. The weather during the month was characterised by dusty days, calming, towards the middle of the month, about noon, to clearness, with nimbus clouds apparent. Towards the end of the month the weather grew from cool to oppressively warm, and the dust storms were stifling. In spite of the lack of rain, foliage retains its green.

Cotton Breeding Station, Gatooma.—

The month was fine, with the exception of a few days of the fourth week, which were hot and sultry. Winds were very variable.

Gatooma.—

Strong winds and dust storms have been prevalent throughout the month of September, the daily temperature being generally below normal. On the 25th a marked change was noticed, the weather becoming close and sultry, and on the 26th and 27th very light showers of rain were recorded.

Zone D.—

Shamva.—

The month was unusually cold, especially from 12th to 26th. Strong south-east winds experienced throughout the month, particularly so at night. No rain has fallen. Water in local streams is still running strong at the month end, but winds have dried up veld.

Mazoe Dam.—

The month of September has been colder than usual this year at this station. High winds have prevailed the whole month, and although anemometer readings show an average of 3.08 miles per hour, when it is considered that this is for the full 24 hours per day, and that the wind probably falls for two-thirds of that time, the actual force is most likely over double this. The large citrus crop has now been picked. A lot of shelling is still outstanding. Many planters have sown a quantity of tobacco seed beds.

Zone E.—

Fort Victoria.—

The month was fine, and warm weather has now set in. The maximum temperature in shade registered was 90 degrees on the last day of the month. Hot, dry winds have been frequent, and visibility reduced latterly owing to haze. Dust storms have been frequent during the month.

Umtali Gaol.—

1st to 8th September: Warm days, with cold night winds. 9th to 12th: Nights close. 13th to 15th: Cold mornings, with mist and drizzle. 16th to 23rd: Cloudy at times, with extremely cold and boisterous winds. 24th to 29th and 30th:—Boisterous winds, with hazy atmosphere.

Riverdene North.—

September has been a windy month, almost daily half a gale blowing from the easterly quarter, which generally subsides towards sundown. The northerly point has been much more prevalent this season, as the general tendency is to prevail from the south-eastern quarter. The atmosphere has been greatly tempered, but the heat haze has been of daily occurrence, so that the thermometer has not registered exceptionally high. The winds are much more harmful to the veld than is the sun. No moisture in any form has fallen this month, save a little dew on one morning. Everything is very dry and badly in need of rain. No grass fires have occurred so far locally. The river Popotekwe is falling rapidly.

RAINFALL.

The following stations have reported rain during the month:—

Zone A.—

Bulalima-Mangwe—	
Solusi Mission	.10
Bulawayo—	
Lower Rangemore	.03

Zone B.—

Bulalima-Mangwe—	
Edwinton	.03
Empandeni	.01
Garth	.39
Retreat	.01
Semokwe Reserve	.05
Gwanda—	
Gwanda Gaol	.76
Mazunga	.37
Matobo—	
Bon Accord	.15
Holly's Hope	.40
Wenlock Ranch	.40
Umzingwane—	
Essexvale	.03

Zone C.—

Chilimanzi—	
Orton's Drift	.14
Umvuma Railway	.57
Gwelo—	
East Clare Ranch	.02
Iron Mine Hill	.20

Zone D.—

Inyanga—	
Juliasdale	.08
Mazoe—	
Mgutu	.15

Mtoko—

Makaha	.06

Zone E.—

Chilimanzi—

Allanberry	.02

Marandellas—

Marandellas N.C.	.14

Melsetter—

New Year's Gift	.07

Umtali—

Embeza	.66
Fern Valley	.02
Park Farm	.13
Sheba	.49
Stapleford	.39
St. Augustine's Mission	.11
Umtali Gaol	.03

Zone F.—

Melsetter—

Chikore	.05
Melsetter	.10
Mount Selinda	.40
Vermont	.39

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Nov.	Dec.
			1927	1927
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	12	10
Banket Junction	Banket Hotel	F. Potts	4	2
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	24	29
Bindura	Bindura Farmers' Hall	W. E. Fricker	12	10
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	2	7
Bubi	Queen's Mine	E. C. Gaudin	8	13
Chakari	Various farms	L. T. Tracey	17	15
Chatsworth	Makowries Farm	A. W. White	5	3
Daisyfield	Somabula (Nov.), Daisyfield (Dec.)	L. E. Edwards	12	17
Darwendale—Trelawney	Various farms	B. Theck	9	14
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	12	10
Enterprise	Farmers' Hall	James Watson	1	6
Essexvale	Essexvale	C. Geneve	20	18
Felixburg—Gutu	Fairburn (Nov.), Felixburg Store (Dec.)	C. L. Burrows	12	10
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	1	6
Gadzema	Gadzema	M. G. Leahy	11	9
Gatooma	Speck's Hotel	B. L. Henderson	19	17
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	12	10
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	7	5
Greystone	Quarrie Farm	P. J. van der Walt	12	.
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	10	8
Inyazura	Inyazura	Major Tulloch	4	2
Lalapansi	Lalapansi	Edmund Chapman	12	10
Lomagundi	Sinoia	F. W. Robertson	...	..
Lomagundi West	Various farms	E. Morton	6	4
Macheke	Macheke	M. J. Palmer	12	...
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	6	4
Makwiro	Makwiro	F. H. Howard	18	16
Makoni	Rusape	—. Munch	12	10

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	4	2
Marandellas, Southern	Various farms	D. J. Gale	2	7
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	11	9
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	10	8
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	19	17
Mazoe (Concession)	Concession Hotel	A. W. Laurie	11	9
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	9	14
Melsetter	Court House, Melsetter	Dr. Rose	10	8
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	9	14
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	26	31
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	4	2
Nyamandhlovu	Nyamandhlovu	R. D. McLean	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	5	3
Poorte Valley	Various places	D. Wilson	19	17
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	19	17
Salisbury South	Various farms	P. Linton	30	28
Selukwe	The Hotel, Selukwe	W. T. Simpson	4	2
Shamva	Shamva Hotel	E. Butler	17	15
Two Rivers Farming Association	Various farms	W. L. Parsons	19	17
Umboe (Branch of Lomagundi F.A.)	Various farms—Dingley Dell (Sept.)	A. J. Hawkes	12	10
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	12	10
Umtali	Drill Hall, Umtali	A. Howat	3	1
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	11	9
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	The Secretary	9	14
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1927.

Month		Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
		Slaughter		Slaughter							
		Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January	...	151		...	1,713	...	...	101	...	...	1,965
February	...	77	...	...	695	...	...	112		...	884
March	...	135	1,837	...	2,375	...	...	50	34	...	4,431
April	...	106	2,574	...	1,440	...	...	28	...	...	4,148
May	...	205	3,458	...	1,299	...	...	118	...	...	5,080
June	...	1,249	6,280	...	1,484	...	...	100	...	...	9,113
July	...	2,569	1,850	...	1,348	50	...	141	...	...	5,958
August	...	955	239	...	2,623	...	...	284	...	...	4,101
September	...	741	8	...	1,452	...	...	134	...	...	2,335
October	...										
November	...										
December	...										

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Farming Calendar.

November.

BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development.

This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in.

If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms.

Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the trees are ready for lifting in the nurseries.

All unthrifty trees could with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

CROPS.

During the earlier part of this month every effort should be concentrated on getting the soil into the best possible tilth, so that the planting of early sown crops such as maize, cotton, ground nuts, kaffir corn and so forth may be carried out under the most favourable conditions. In the event of unusually early rains, it is often better to concentrate on thorough preparation of the land rather than to hasten the planting, and the better the preparation the more rapid the progress of the crops when planted. Particular attention should be given to planters to ensure that they are in good working order.

Given favourable weather conditions, the planting of cotton, maize and velvet beans for seed or ploughing under will probably begin about the middle of the month, and from this time onwards will be continued as rains permit.

DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

ENTOMOLOGICAL.

Maize.—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th

November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure. If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

Tobacco.—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

Potato.—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

Kitchen Garden.—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

Deciduous Fruits.—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

FORESTRY.

Prick out into tins or trays any seedlings that are ready. Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots. Cross plough and harrow land to be planted. If fresh seed is obtainable, sow seed of Cedrela toona. Late sowings of Eucalypt seed may still be made.

POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, but it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come through it best. More green and animal food should be given, and the utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt to fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out.

Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks, and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland general'y, with the exception of the eastern border, where it amounts to five inches.

Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

Government Farm, Gwebi.

SEEDS FOR SALE.

Kinvarra Oats	25/- per 100 lbs.
Linseed	6d. per lb.
Boer Manna	4d. ,,
Red Manna	4d. ,,
Majorda Seed	1/- ,,
Sunflower Seed (Large Black)	15/- per 100 lbs.
Sweet Potato Slips	5/- per bag
Napier Fodder Roots	5/- ,,
Kikuyu	5/- ,,

Prices are f.o.r. Gwebi. Before sending cheques, intending purchasers are advised to ascertain that the seeds required are still available. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Salisbury.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Bulawayo District.
7.10.27.	Government Notice No. 550 releases from the areas of infection the farms Hyde Park and its extensions, Lower Rangemore, Dunstall and sub-divisions, Roseburn, Craiglea and Craiglea A, Naseby North and South, and Stanhope South. The guard area is slightly amended accordingly.
	Gwelo Native District.
7.10.27.	Government Notice No. 551 cancels the guard area and leaves the farms Clearwater and Finchley as an area of infection only.
	Umtali Native District.
7.10.27.	Government Notice No. 552 releases the farms Valhalla and Rhine from the areas of infection and amends the guard area accordingly.
	Mazoe Native District.
14.10.27.	Government Notice No. 556 releases the farm Burnleigh from all restrictions.
	"FERTILISERS, FARM FOODS, SEEDS AND PEST REMEDIES ORDINANCE, 1914."
23.9.27.	Government Notice No. 528 contains the regulations for the sale of stock dips throughout the Colony of Southern Rhodesia.
	"GAME LAW CONSOLIDATION ORDINANCE, 1906, AMENDMENT ACT, 1926."
30.9.27.	Government Notice No. 540 amends Government Notice No. 182 of 1927 by the deletion of section 1 under "Description of Areas" and the substitution of the following section:— "1. That portion of the Lomagundi district lying between the Hunyani and Angwa Rivers north of latitude 17° 10′ S. and south of the escarpment."

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 388. Kudzu Vine, by H. G. Mundy, F.L.S.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agr., F.L.S., Chief Agriculturist.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 552. Mixed Farming in Matabeleland, by Gordon Cooper.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 571. A Farmers' Calendar of Crop Sowings, by C. Mainwaring.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 245. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

TOBACCO.

No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

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No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.

No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.

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No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.

No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.

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No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.

No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.

No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.

No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.

LIVE STOCK.

No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.

No. 227. An Experiment in Beef Production, by R. C. Simmons.

No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.

No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.

No. 336. Butchering and Flaying.

No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.

No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part IV., by R. C. Simmons.

No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.

No. 392. Memorandum on the Cattle Industry of Southern Rhodesia, 1921.

No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 448. The Cattle Industry.

No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

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No. 624. The Construction of Dipping Tanks for Cattle (Revised).

Arsenite Cattle Dip—How to Mix.

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No. 604. Farm Butter Making, by T. Hamilton, M.A., N.D.D., N.D.A., Dairy Expert.

No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.

No. 612. Production of First-Grade Cream, by J. R. Corry, B.Sc.

No. 647. The Feeding of Dairy Stock in Southern Rhodesia, by T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.).

Drawings of cow byres and a farm dairy can be obtained upon application to the Dairy Expert, Department of Agriculture, Salisbury.

VETERINARY.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.

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No. 642. The Laboratory Diagnosis of Animal Diseases, by Ll. E. W. Bevan, M.R.C.V.S.

Services of Government Veterinary Surgeons.

IRRIGATION.

No. 270. Odzani River Irrigation Scheme, by W. M. Watt.

No. 376. Notes on the Water Law of Southern Rhodesia, by R. McIlwaine, M.A., LL.B.

No. 384. The Application of Water in Irrigation, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 400. Soil Washing, by A. C. Jennings, A.M.I.C.E., A.M.I.E.E.

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No. 632. Domestic Water Supplies and Sanitation on the Farm, by P. H. Haviland, B.Sc. (Eng.).

No. 633. The Cost of Pumping for Irrigation, by R. H. Roberts, B.Sc. (Eng.).

No. 640. Levelling for Irrigation, by Dr. W. S. H. Cleghorne, M.I.Mech.E.

FORESTRY.

No. 439. Forestry in Rhodesia: Planting and Care of Forest Trees, by J. S. Henkel.

No. 512. Indigenous Timbers for Fencing, by J. S. Henkel.

No. 528. Forestry in Southern Rhodesia: Timber and Fuel for Tobacco Growers, by J. S. Henkel.

No. 555. Forestry in the Melsetter District, by J. S. Henkel.

No. 575. Tending of Eucalyptus Plantations, by A. S. Thornewill, B.A.

No. 578. Rules for Tree Planting, by A. S. Thornewill, B.A.

No. 611. Wind Breaks and Shelter Belts, by A. S. Thornewill, B.A.

No. 619. Price List of Forest Tree Transplants, Ornamental Shrubs, Hedge Plants and Seeds obtainable at the Government Forest Nursery, Salisbury.

No. 620. Trees and Shrubs for Sale. Obtainable at the Government Forest Nursery, Mtao Forest Reserve, Fairfield Siding, P.B. Umvuma.

No. 621. The Raising of Plants from Cuttings, by A. S. Thornewill, B.A. and Dip. in Forestry (Oxon.).

HORTICULTURE.

No. 471. Budding of Citrus Trees, by A. G. Turner.

No. 596. Establishment and Care of a Home Orchard, by G. W. Marshall, Horticulturist.

No. 637. Harvesting, Packing and Marketing of Deciduous and Tropical Fruits, by G. W. Marshall, Horticulturist.

A Comparative Study of the Citrus Industry of South Africa, by Herbert J. Webber, Ph.D., D.Agr. Price 2s.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

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A scene in the Sabi Valley

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.

Leave of Absence—Mr. W. E. Meade.—The editor of this Journal, Mr. W. E. Meade, proceeded on six months' vacation leave on the 21st November. Mr. E. H. Berry, of the Department of Agriculture, will carry on the editorial duties during Mr. Meade's absence.

The Australian Tobacco Trade.—We made a reference in the October issue of this Journal to the Australian tobacco trade, in the course of which we mentioned that the Commonwealth was at one time regarded as a possible

market for Rhodesian tobacco and that an investigation of the position was made in 1913 by Dr. Eric Nobbs, late Director of Agriculture. We have now obtained some further particulars which it may be of interest to publish.

According to the *Western Tobacco Journal* more than 97 per cent. of the leaf tobacco and 40 per cent. of the tobacco products imported into Australia are of American origin. The greatest demand in Australia, however, is for leaf tobacco rather than manufactured products, as the manufacturing industry is of some importance in that country and little tobacco is produced. The total imports of leaf tobacco into Australia during the fiscal year ended 30th June, 1926, amounted to 22,000,000 lbs., and over 21,000,000 lbs. came from the United States.

Cigarettes and chewing tobacco are the most important among the tobacco products imported. The chewing tobacco trade is supplied almost entirely by the United States and the cigarette trade by the United Kingdom.

The Australian tobacco trade is principally in the hands of the British Australasian Tobacco Co. and its affiliated companies, with an invested capital of over £7,000,000 sterling.

The types of American tobacco most used in Australian factories are cutters and leaf for cigarettes, and bright and dark fillers for pipe tobacco; according to data furnished by the American Consul General. Virginia bright types and chocolate types suitable for plug tobacco are also in demand.

Tobacco Prices.—The following is an extract from the monthly report issued by Messrs. Frank Watson & Co., Ltd., tobacco importers, of Liverpool:—

"We know the Rhodesian growers—and, we think, to some extent, the South African growers—have taken to themselves the notion that it is the superior quality of their product to the American which has greatly increased its consumption here. This is, however, entirely erroneous: the increased consumption is due, not even entirely to the preference, but to the very strong pressure put by the present Government on the manufacturers of the country to use Colonial tobacco to the full extent of their power. Probably

no firm in this country has worked harder than we have, through our connections with the various tobacco monopolies on the Continent, to introduce there Empire-grown tobaccos, but the extreme prices which have been demanded prevent consideration of the tobacco. The only country in the Empire which has succeeded in introducing its tobacco on the Continent of Europe is India, on account of the price. In our opinion, if larger crops are to be grown and marketed, the South African farmers will have to endeavour to look less to the preference and more to the world price of tobacco."

We do not think that any claim has ever been advanced by Rhodesian growers that their leaf is superior to that produced in America, certainly not by any responsible organisation of growers. It is realised full well that Rhodesian tobacco will be sold at the world price, but the fact cannot be overlooked that the preference enables the manufacturer to procure it for 2s. 0½d. less than he pays for American leaf. This in itself will, we think, be sufficient inducement to the Home manufacturer to use Empire tobacco in large quantities once the smoking public has been weaned from the use of American.

North Devon Cattle Feeding Trials.—Some interesting details of an experiment which has been going on in north Devon in the production of baby beef are given in the Journal of the Ministry of Agriculture for October. For some years the age at killing has been steadily reduced. It used to be three years old; it is now a little over a year. This means that a calf of the right stock—that is, one having the heredity quality of early maturity—can be fed to a stage when it produces good beef—and, incidentally, the smaller joints that are required by households to-day—at a little over a year old. The experiment was arranged by the North Devon District Agricultural Committee about 18 months ago, when one of its members undertook to put four young calves under the supervision of the district lecturer to be fed systematically according to his prescription. They were North Devon calves, de-horned soon after birth. They were fed in the stall up to 17 months old, when they were sold for beef; they were about 8 cwt. each at slaughter and realised a trifle over £24 each—60s. per live cwt. In the same market

in which they were sold the best quality beef steers and heifers of about $2\frac{1}{4}$ to $2\frac{1}{2}$ years old, averaging $11\frac{3}{4}$ cwt., realised approximately 53s. per live cwt. The older animals therefore, which had to be fed for a year longer, realised a good deal less per live cwt. and were not correspondingly heavier. It is not suggested that the actual profit on the sale of these 8-cwt. beasts is likely to be very high; indeed, it may merely be the value of the manure from the foods consumed. For the first fortnight the calves were fed on their mothers' milk and each subsequently received a total of 116 gallons of new milk. The experiment aroused keen interest and will be repeated on other farms in north Devon. It is probable that smaller quantities of new milk will be given, and the stock may be sold earlier if a favourable market presents itself. Had the four beasts been sold in June it is thought they might have realised up to 70s. per live cwt. instead of 60s.

World's Dairy Congress, July, 1928.—A preliminary announcement has been made by the general committee of the World's Dairy Congress, which is proposed to be held in Great Britain in July, 1928, under the patronage of His Majesty the King, giving a brief description of the various questions that would be dealt with at the congress. This congress is being organised by a committee representative of all aspects of the dairy industry of Great Britain independently of the Government, but has the full sympathy and support of both the Ministry of Agriculture and the Ministry of Health, which have representatives on the committee.

With a view to making the congress thoroughly representative it has been proposed that the papers to be considered at the various sessions should fall under the four following main groups:—

Milk Production.—Embracing all matters bearing on the production of clean, wholesome milk; the breeding, feeding and management of dairy cattle, etc.

Milk Distribution and Manufacture.—Under this group papers dealing with milk from the time it leaves the farm till it reaches the consumer will be discussed; also transport facilities, marketing, co-operative facilities, methods of processing milk, manufactured products, etc., will be dealt with.

Milk Consumption.—The importance of milk in the human dietary, and propaganda to encourage the consumption of milk will receive consideration under this section.

Administration and Control.—In this category will be included the aspects of official intervention in the milk industry, whether by subsidising the education and research or by regulating the conditions under which milk and milk products may be produced, distributed or consumed.

It is probable that the sessions of the congress will be held in London, Reading, Edinburgh and Belfast. Excursions will be arranged to places of interest throughout the United Kingdom, and every effort will be made to present to the delegates and representatives a comprehensive survey of the organisation and methods of the milk industry of the country.

The general committee of the dairy congress welcome the attendance of all who are interested in the congress, whether as producers, distributors, scientists, health administrators, welfare workers or consumers, when eminent authorities from the British Empire and foreign countries will deliver papers. A free discussion of the latest knowledge and discoveries relating to milk and dairy products will be allowed.

It has been decided that all accepted papers for the congress be printed in English and in such other language as may be deemed advisable, and circulated before the congress.

Further information may be obtained from the Organising Secretary, the World's Dairy Congress, 1928, 28, Russell Square, London, W.C. 1, England.

Imperial Agricultural Research Conference.—Some interesting remarks were made by the Right Hon. Walter Guinness, Minister of Agriculture, in opening the Imperial Agricultural Research Conference, to which reference was made in the October issue of this Journal. Agriculture, said Mr. Guinness, is our largest Empire industry. Its output in Great Britain alone reaches a value of £225,000,000 a year, and when one realised that in the vast overseas terri-

tories of the Empire 80 per cent. were living by agriculture, that industry would be seen as the giant pillar of its life and prosperity.

We live in a time of complexity and change, and those industries which stood still were quickly left behind. We must look to research to improve the results of industry. By this means alone could a better standard of living be secured. Among the past triumphs of research Mr. Guinness mentioned the discovery of artificial fertilisers, the application to agriculture of Mendel's principles of heredity in plant and animal breeding, and Sir Arnold Theiler's work on animal diseases in South Africa. At present the efficiency of plants as transformers of the sun's energy was, for the best field crops only about 1 per cent.—far behind the worst motor car engine. Research might show a way of raising the return of the soil for human labour. Great results might also come from the control and taming to human purposes of the vast population of micro-organisms in the soil. Already new discoveries in this direction had enabled them to inoculate leguminous plants, artificially to convert straw into manure and to get favourable results from a partial sterilisation of the soil.

It might seem surprising that men who dealt with the problems of pastures and corn fields of temperate climates could help in the solution of the problems of tropical production, but the fundamental principles of agriculture are the same everywhere. As an example of co-operation throughout the Empire, Mr. Guinness mentioned the work now proceeding on the mineral content of pastures at Aberdeen, which was linked up with researches in Australia, New Zealand and Kenya. The conference would also seek to ensure that work done in one part of the Empire should become known to workers on the same subject elsewhere. Agriculture was a complex of many sciences, and the bulk of its literature was so overwhelming that it was necessary to save it from being buried under the load of its own type. The conference would have an opportunity of seeing on the spot the agricultural research organisation which had been developed in Great Britain, under the guidance of Sir Daniel Hall, largely within the last eight years. Although Great Britain could not compare with the United States in the

money spent or the magnificence of equipment, he hoped that they would be convinced that there was no need to look to another country as the Mecca of agricultural research. The work of the conference would be inspired by the idea of mutual help to secure that on the ocean of agricultural research a man should not voyage alone if there was a fellow voyager by whose companionship he could be helped and inspired.

Agriculture in Kenya.—We have to acknowledge with thanks the receipt of the annual report of the Department of Agriculture, Kenya Colony, for the year 1926.

We gather from the report that increasing attention is being given to the mechanisation of farm operations, notably in the use of agricultural tractors, power machinery generally and labour-saving implements and appliances. Experience in Kenya, as elsewhere, points to agricultural tractors being regarded as an important and valuable adjunct to the draught ox, particularly on large holdings.

It is stated that the prices of farm products consumed locally have shown further tendency to increase, and, particularly in the products of pastoral farming, they are high.

The apprehension expressed in last year's report on account of labour shortage has been removed to an appreciable degree. African labourers have been offering their services in increasing numbers, and it cannot be said that, except in rare cases, production and development suffered through an insufficiency of unskilled labour.

At the instance of the Committee of Civil Research, Dr. J. B. Orr, head of the Rowett Research Institute, Aberdeen, visited Kenya with a view to examining the prospects for research work in connection with malnutrition and deficiency diseases, and as the result, experiments have been commenced at four centres upon the feeding of cattle, the cost, except in regard to local expenditure, being met from funds provided by the Home Government.

The report goes on to state that a creditable amount of research and experimental work has been carried out by the staff at the Scott Agricultural Laboratories and the Veterinary Research Laboratory, but it is desired again to

emphasise the necessity for organising scientific and technical services in advance of the need.

The total value of agricultural exports, the produce of Kenya, in 1926 was £2,211,665, a decrease of £83,034 compared with the previous year. This decrease is almost entirely due to a falling off in the quantity of maize exported, which decreased by £125,707 or 12,169 tons.

The total area allotted for occupation by Europeans is approximately 5,000,000 acres, and in addition to this an acreage of about 2,000,000 acres is available for alienation. Of the area allotted, 4,587,817 acres are in occupation, showing an increase of 167,244 acres over the previous year. The number of occupiers totals 1,809, of an increase of 114 over the previous year. The total area cultivated is 463,854 acres, giving an average of 286 acres per occupier, against 232 and 154 acres for the years 1925 and 1921 respectively. Including the development through live stock, on a basis of six acres per head for cattle and three acres per head for small stock, the average development by each European occupier is 1,311 acres, which shows the extensive character of farming operations in the Colony.

On 31st July, 1926, the total area under crops—European—was 401,041 acres and the total area under cultivation was 463,854 acres. Of this total, 193,187 acres were under maize, 43,765 acres under wheat, 68,950 acres under coffee and 60,197 acres under sisal. The area planted with tea increased by 342.1 per cent. in 1926 and amounted to 1,689 acres. The average yield of maize over the whole country is about six bags per acre.

The Canadian Cattle Export Trade.—In view of the fact that this Colony already figures in the list of exporters of live cattle to the United Kingdom and hopes at some future time to participate prominently in this trade, it will perhaps be of interest if we review briefly some of the salient features of the Canadian trade as given in a recent bulletin issued by the authority of the Minister of Agriculture, Ottawa.

It is stated that the removal in 1923 of the embargo on store cattle entering the United Kingdom provided the only unrestricted export outlet. The word unrestricted is used with reference to tariff charges such as operate in the matter of export to the United States of America. In 1924, shipments of cattle to Great Britain amounted to 82,000 head; in 1925, 110,250; in 1926, 76,250. During the first four months of 1927 only 7,106 were exported as compared with 28,468 head for the corresponding period of 1926.

These figures indicate a marked falling off. Even with the limited number sent forward in 1927, prices have been relatively low and losses to the shippers the rule. From what is written it would appear that the export cattle trade has not at any time been markedly profitable and that the main benefit has been its effect as a stabiliser and a very necessary outlet to an otherwise congested market.

The following are advanced as adverse factors in so far as conditions in Great Britain are concerned:—

1. The great coal strike and the disastrous effect thereof on the buying power of the British consumer.

2. The meat war among firms operating in Great Britain has forced prices down.

3. Argentine chilled and frozen meat of good quality is abundant and cheap as compared to the Home finished article. The finest quality Argentine beef has been selling at the same and even lower prices than apply to Canadian cattle alive. The buying public has apparently turned more to this, catering to their pockets rather than their palates. The result to the British feeder has been lower prices than he expected on his Home finished cattle. He claims that he must buy good Canadian stores cheaper than in the past. The Canadian shipper, on the other hand, claims positively that he must get more money for his stores or fats than in the past if he is to continue.

In spite of a reduction in ocean transportation, the cost of landing cattle in British markets is very high. Freight charges from points in Western Canada to the eastern seaboard are such as to make profits to the shipper extremely doubtful. For every service rendered and every bit of food consumed the shipper pays the limit. In short, it is de-

finitely stated that the export cattle trade is at the present time a distinctly losing venture, and unless shipping costs are materially lowered, will continue on the doubtful list.

At the same time prices on the Canadian stockyards are considered satisfactory. There has not for years been a keener demand for good stockers and feeders. American buyers are dominant in western markets and contracts are let with Canadian ranchers for years in advance. Western Canada would appear to be one great source of feeder cattle supply for Ontario and Quebec, for the United States and for the British market.

In spite of present conditions, in spite of the Argentine cheaply produced beef and in spite of the great strides of the Irish Free State in cattle improvement, it is thought there will be a continued demand under improved conditions for Canadian live cattle in Great Britain. But this demand is for a young bullock of the right type, weighing around 900 lbs. and not over two years old, not for the heavy, often rough steer, weighing from 1,200 to 1,600 lbs. and from three to five years old.

In subsequent remarks the opinion is advanced that in all the markets supplied by Western Canada, type, quality and breediness are prime requisites. For beasts of this type good prices are obtainable. "That there are not enough good ones to go around is simply another way of saying that there are not enough good bulls in Western Canada." The bulletin concludes by emphasising the significance of the point that for the past year or more, but particularly of late, the Irish have been the great buyers, not of the high-priced show bulls at the Scottish bull sales, but of the great bulk of the good commercial kind. Herein lies the hope of this Colony if we are to figure prominently in this cattle export trade.

Tobacco Pests of Rhodesia.

By RUPERT W. JACK, Chief Entomologist.

The following article is a revision of Bulletin No. 347, the text of which originally appeared in the numbers of the *Rhodesia Agricultural Journal* for December, 1919, and February, 1920.

The chief insect troubles which planters in this Colony have to fight are connected with the seed beds and the newly-planted crop. Once the plants have become well established in the field there is, as a rule, little danger of serious loss from this source, although in certain seasons cutworms are a continuous nuisance, and budworms commonly call for attention.

Cutworms (see Plates I. and II.).—Cutworms are smooth caterpillars, the larvæ or young of certain inconspicuous night-flying moths. Four species, namely, *Euxoa segetis*, Schiff., *E. longidentifera*, Hmpsn., *E. spinifera*, Hubn., and *Agrotis ypsilon*, Roths., have been identified as attacking tobacco in the Territory, but of these only the first and last are of real importance, the remaining two species having only been found in small numbers associated with the others. The adult moths of the four species are shown on Plate I.

Cutworm moths are on the wing throughout the year. They are of nocturnal habits, lying hidden in sheltered situations throughout the day. In warm weather the females begin to lay about four days after emergence. The eggs are laid in great numbers amongst suitable low-growing vegetation, attached to the stems of plants, to stones, lumps of earth, sticks or other stable objects. One female, *E. segetis*, laid as many as 1,766 eggs in confinement, a figure that should give some idea of how such immense numbers of cutworms may appear suddenly in favourable situations. The eggs hatch in from five to eight days.

The very young cutworms feed mainly on prostrate leaves and other soft tissue within their reach, but will frequently ascend a plant for an inch or so in order to reach the lowest leaves. They keep in seclusion as much as possible, hiding under leaves and rubbish. Later they develop the habit of burying themselves in the soil during the day and feeding at night; as they grow larger, they feed upon the stems of plants at the ground level, frequently severing small stems completely in a single night, so that the young plant is seen lying on the surface of the soil in the morning. This characteristic habit is the origin of the name "Cutworm."

The growth of a cutworm from the time of hatching to pupation may, under summer conditions, be completed in as little as twenty-nine days, but the average is a few days more. In cold weather the growth may occupy several months. When full-grown the cutworm enters the ground for an inch or two and there constructs a cell or cocoon of soil particles cemented together. Within this cell it changes to a brown pupa or chrysalis, emerging as a moth in from a fortnight to three weeks in the summer, but taking longer in the winter. The broods are quite irregular throughout the year, moths having been bred out during every month. There are probably about four complete generations of *E. segetis* during the year.

Control.—Attack on seed beds may be due to one of two different causes. The surroundings of the seed beds may be infested with cutworms which later invade the beds themselves, or more commonly the eggs are laid by the parent moth amongst the young seedlings, and cutworms and plants grow up together. In the latter case the damage tends to be continuous, as a very small cutworm is quite capable of demolishing a germinating tobacco plant, and larger specimens will sever anything of the nature of a seedling.

Preventive measures in connection with seed beds, therefore, lie in keeping the ground around the seed beds as free as possible from vegetation, in order to discourage moths from laying eggs there, and in constructing the beds in such a way that moths are excluded. For the latter purpose, the sides need to be built of brick neatly finished, and the covers to be in one piece, free from holes and carefully weighted down so as to leave no chink through which a

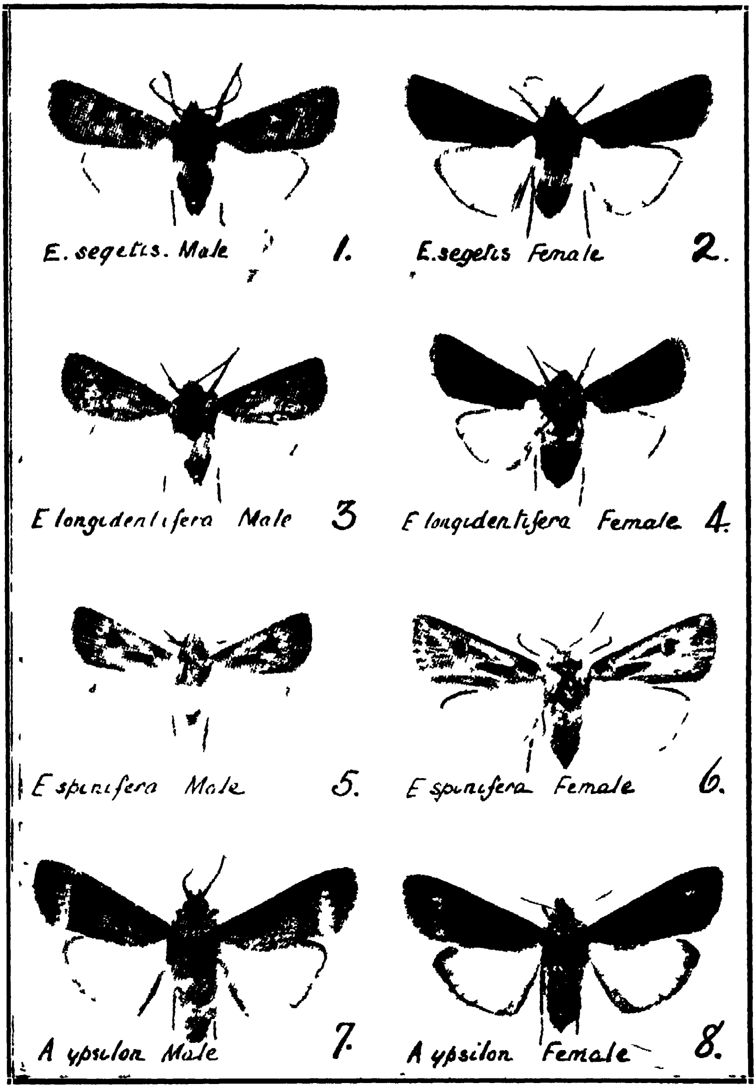

E. segetis. Male 1.
E. segetis Female 2.
E longidentifera Male 3
E longidentifera Female 4.
E spinifera Male 5.
E spinifera Female 6.
A ypsilon Male 7.
A ypsilon Female 8.

Plate I

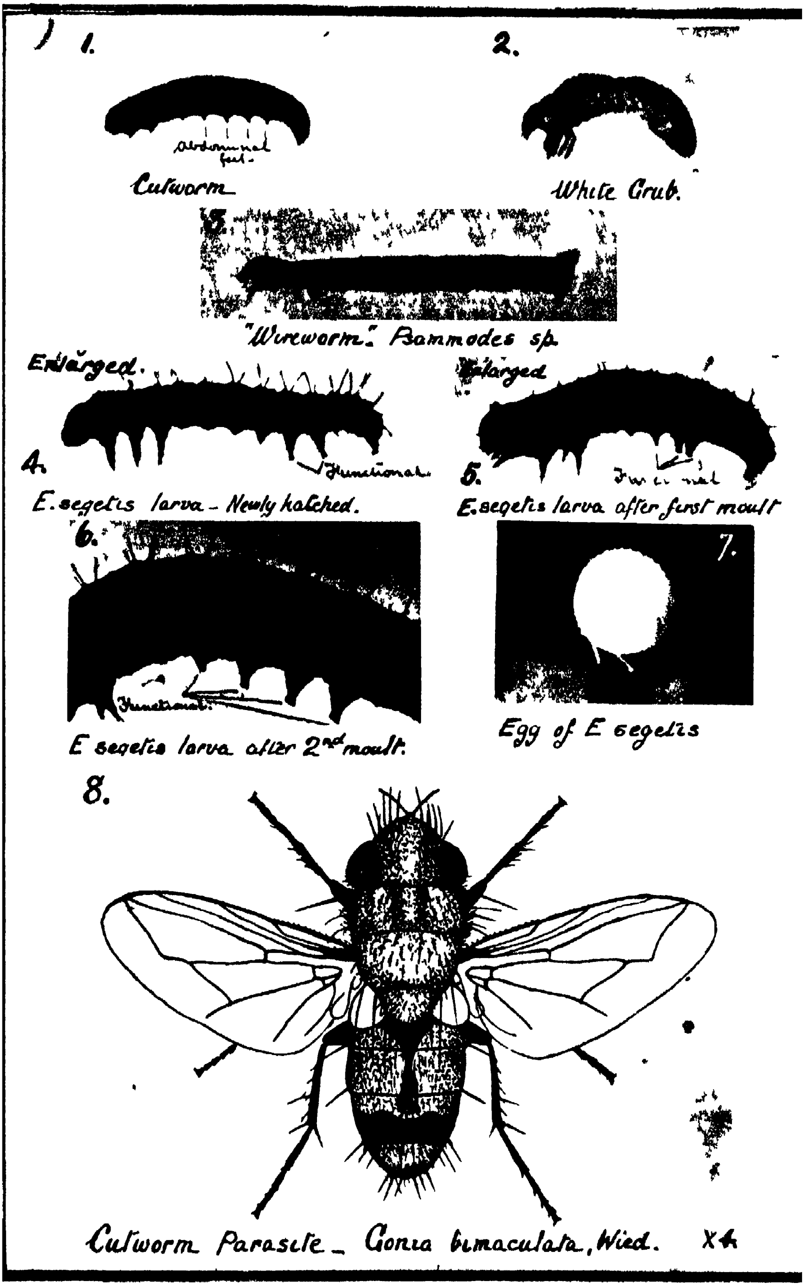

1.
abdominal feet
Cutworm
2.
White Grub.
3
"Wireworm." Psammodes sp.
Enlarged.
4.
Functional
E. segetis larva - Newly hatched.
Enlarged
5.
E. segetis larva after first moult
6.
Functional
E segetis larva after 2nd moult.
7.
Egg of E segetis
8.
Cutworm Parasite - Gonia bimaculata, Wied. X4

Plate II

moth might enter. During the hardening off process covers should be replaced before sundown. It must never be overlooked that the seed bed, with its artificially stimulated array of succulent plants, constitutes a strong attraction to female cutworms desiring to lay, on account of the scarcity of such vegetation elsewhere during September and October, and that the defences need to be correspondingly effective. It may further be noted that, although the moths are nocturnal in habit, they may be disturbed from weeds and herbage by anyone moving about during the day and immediately seek another resting place. In this way female moths may be driven from weedy surroundings into beds which happen to be open at the moment, with the result that a few hundred hungry cutworms may put in an appearance shortly after. Clean surroundings are therefore desirable from all points of view.

As a further protection the young plants from the time they show foliage of the size of a sixpence may be sprayed weekly with arsenate of lead (paste), 1 lb.—16 gallons, or arsenate of lead (powder), 1 lb.—30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the young seedlings and so ingest the poison. It is useless to wait until large cutworms are present, as these will not yield to any known treatment other than the laborious method of hand-picking.

Attack on crops in the field may be due to a weedy condition of the land previous to planting, or to an invasion from the neighbouring veld. Up to the present such attack has only been recorded during an unusually wet season, on tobacco lands which are very low lying and on irrigated lands. It has been proved definitely that cutworms in this Territory do not pass the winter in a half-developed condition and attack the crop in the spring, as is the case in cooler latitudes. They must either feed up and pupate, if food is available, or starve if it is not. The temperature, especially during the latter part of the dry season, is too high to allow of the vital processes of the caterpillars being suspended until the next crop is available for food. It follows, therefore, that cutworms which attack the young plants as soon as they are planted out are the result of eggs laid a few weeks previously either amongst the herbage of

the neighbouring veld or amongst weeds on the land itself. As a matter of fact, most outbreaks are traceable to the latter cause. Prevention therefore lies mainly in *keeping the land free from weeds up to the time of planting*. Serious invasion from the surrounding veld probably takes place but rarely in respect to tobacco lands. It is difficult to avoid.

The standard *remedy* for cutworms all over the world is poisoned bait. Paris green, molasses and water mixed with bran has been found very efficacious in North America. In the South African Union arsenite of soda, sugar or molasses and water, used to wet chopped greenstuff, such as lucerne, potato tops, etc., has been recommended. It has, however, been found that in this Colony the commonest cutworm, namely, *E. segetis*, is repelled by arsenite of soda, and is not attracted to a great extent by bran or meal baits. Paris green is, on the other hand, an effective poison, and greenstuff is, of course, attractive. It is questionable whether the addition of sugar or molasses adds to the attractiveness of fresh greenstuff, but it certainly increases the adhesiveness of the Paris green, and may help in regard to attractiveness if the greenstuff is wilted. The following formula may be used:—

Paris green, 1 lb.
Crude molasses, 2 gallons.
Water, 10 gallons.

The greenstuff needs to be of a succulent nature. Potato tops, bean foliage, young maize or kaffir corn, barley, lettuce, turnip tops, rape, etc., etc., are suitable. The greenstuff should be chopped up into short lengths, dipped in the liquid, which must be kept stirred, drained and distributed broadcast, but very thinly, over the infested land; or a small quantity of bait may be placed close to, but not touching, each plant. This is preferably carried out in the late afternoon, so as to be as fresh as possible during the night when the cutworms feed.

Recent research work by Dr. L. B. Ripley at Cedara Experiment Station, Natal, has resulted in the evolution of a new formula for poisoned bait, namely, a 2 per cent. solution of sodium fluoride in water. The most effective carrier was found to be prickly pear leaves cut into squares

about the size of a sugar loaf and soaked in the poison. Dr. Ripley's directions are as follows:—

> "Practical directions for making the bait may be given as follows: To 2 gallons of clean, soft water add 0.4 lb. of commercial sodium fluoride (95 per cent. pure approximately), and stir. Chop up an equal volume (2 gallons) of prickly pear into pieces the size of a thumb, using a sharp cane knife, butcher's cleaver, or similar instrument. The blocks should be clean-cut and not crushed by using too dull a knife. (A native can chop up this amount in less than half an hour.) Add the prickly pear to the solution and stir. Soak overnight, preferably stirring once or twice during the soaking. Drain through a coarse sack or some wire mesh. Save the residue for house-fly bait. This liquid will keep indefinitely. Spread the bait broadcast, or drop a little, nearly touching the stem of each plant. It should be used the same day it is made, since it will not remain attractive longer than two or three days, even when kept in the solution. It does not dry up too quickly to prevent its use on a sunny day, if necessary. The formula must be followed closely, since other strengths or other proportions of prickly pear and solution may repel the cutworms or fail to kill them. A second lot of prickly pear must not be soaked in the same liquid."

This bait has been tried under cage conditions at Salisbury and proved effective in destroying the common species of cutworm, namely, *E. segetis*.

Dr. Ripley adds later:—

> "Although the use of ordinary foliage is not recommended, on account of its drying up too quickly, greenstuff with a rough surface, such as bean leaves or turnip tops, wet in a 2 per cent. solution, gives fairly good results and may be used in the absence of preferable carriers. (Experiment No. 25, Table 1.) Such greenstuffs should be spread in the late afternoon or on a cloudy day."

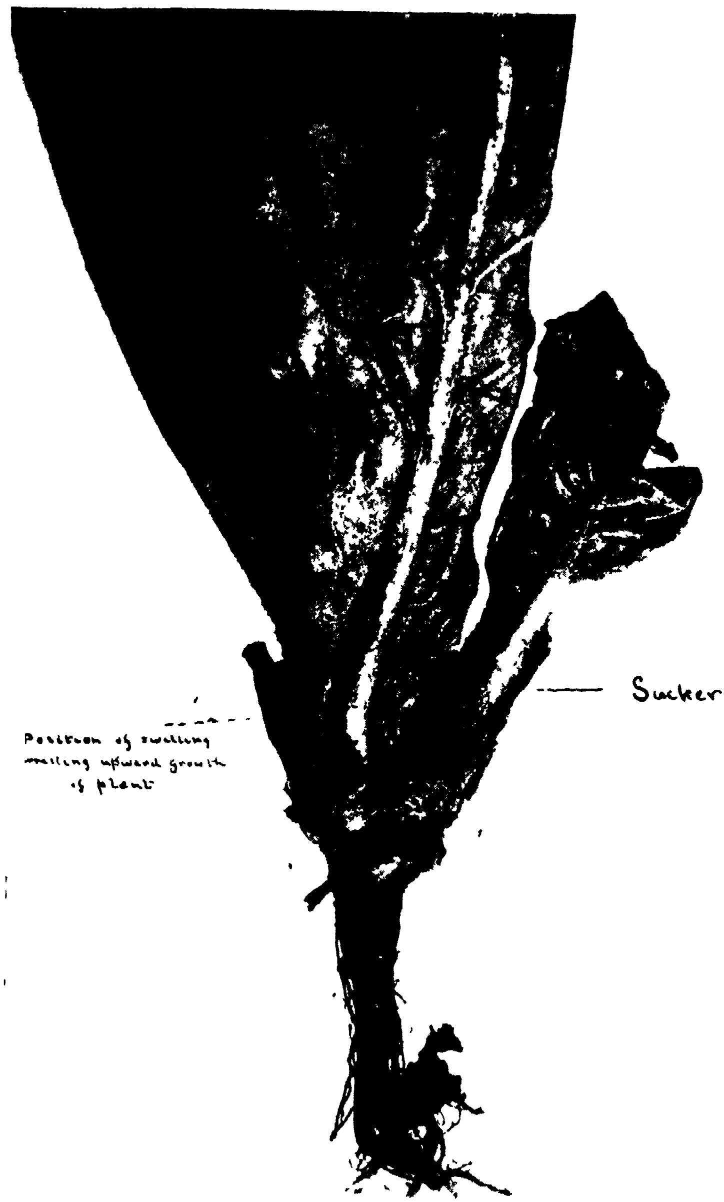
It must be admitted that the position in regard to efficient carriers for cutworm bait in Southern Rhodesia is

unsatisfactory. Prickly pear is not obtainable anywhere in the Colony where it is likely to be required for the destruction of cutworms. There is, however, no obstacle to the cultivation of spineless cactus for this purpose. This plant does not grow very fast away from the semi-arid areas, but would appear to thrive well enough to furnish a limited supply of leaves for the purpose indicated. Other succulent plants are usually scarce and valuable at the time of year when the bait is required. It is decidedly unfortunate that farinaceous foodstuffs have proved unattractive to our common species. Research in reference to control of our native cutworms is still proceeding.

Poisoned bait is most effective if the land is free from young plants at the time, and may be used as a precautionary measure previous to planting, if the land is known to be or judged likely to be infested.

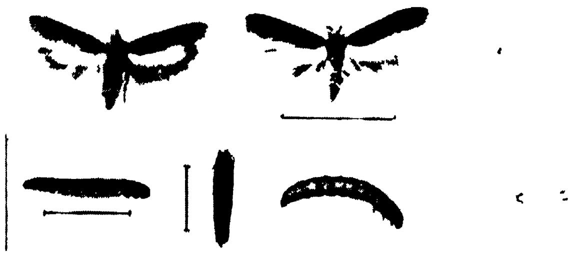
Stem Borer (*Phthorimaea heliopa*, Lwr.), Plates III. and IV.—The adult form of this pest is a small moth measuring about half an inch across the extended wings. It is closely allied to and much resembles the moth of the Tobacco Miner, but may be distinguished by its yellower coloration.

The female moth lays her eggs singly on the leaves or elsewhere on the plants, and these hatch during the summer in about a week. The newly-hatched larvæ have been observed to bore into the nearest part of the plant, and this is frequently the leaf tissue. These preliminary mines, however, are usually vacated very quickly, some being only about quarter inch in length, others up to one inch. The larvæ also mine into the midribs, and may possibly work their way thence into the stem. The favourite point of entry into the stem seems, however, to be close to the base of the leaf petiole under the bud. The presence of the larva in the stem causes a swelling to form, and, if the plant is a seedling, the growth ceases above the swelling and suckers are put out from beneath. When full-grown the larva prepares an exit hole in the side of the gall, leaving the thin epidermis still intact, and changes to the pupa or chrysalis stage with its head facing the exit, the pupa being held in position with web. Moths bred through from egg to adult at Salisbury emerged in from sixty-one days after the first eggs were noted, or from sixty-four

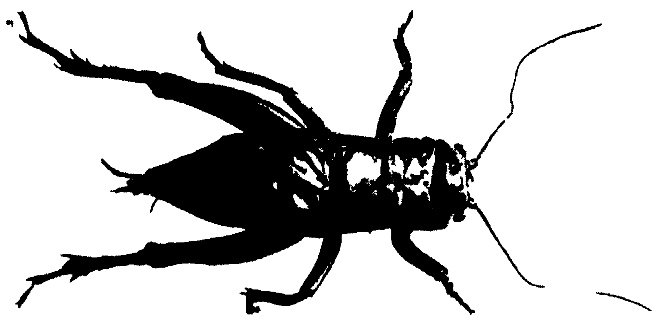


Tobacco Plant Injured by Stem Borer

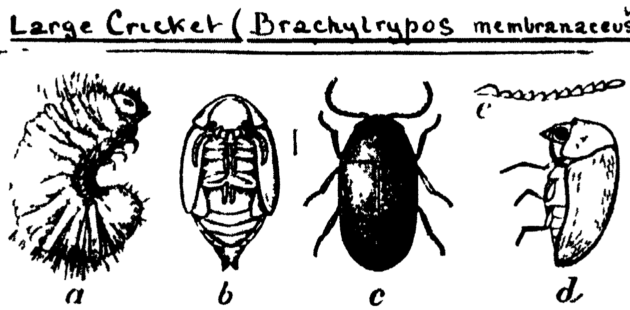
Plate III



"Splitworm" Moth (Phthorimaea operculella)
Enlarged



Large Cricket (Brachytrypos membranaceus)



The [illegible] beetle: a, larva; b, pupa; c, adult; d, side view of adult; e, antenna; all greatly enlarged, e still more enlarged. (After Chittenden, U. S. Dept. Agr.)

Plate IV

after the parent moths were confined with the growing plants. In this way eggs laid in the seed beds in October produce moths in December, and two more generations follow in the field, moths from the last one appearing in May or June. The broods, however, are evidently quite irregular, moths emerging throughout the year.

It may be mentioned that no food-plants other than tobacco have as yet been discovered in this Colony, but such must occur, as the insect is obviously native to Africa. It has also been noted as a tobacco pest in India. Loss in this Territory seems mainly to be due to infestation of the seed beds, but damage also occurs in the field, and if infested seedlings are planted out the loss from field infestation may be considerable. Heavy loss in the field appears, however, more or less confined to dry seasons, and the same phenomenon has been noted in India.

Control.—Moth-proof seed beds must, of course, take first place in preventing attack. Regular spraying with an arsenical compound as recommended against cutworms is also likely to act as a check. The destruction of all tobacco plants in the field after the crop is harvested is beneficial in stopping breeding over the winter. In this connection attention should also be paid to volunteer plants springing up around the homestead, curing barns and elsewhere. Finally, infested seedlings should never be planted out, for not only are they useless, but they breed moths to attack other plants in the field. The swelling under the bud is easily noted, and should cause the immediate destruction of the plant by fire.

Remedial measures are hardly practicable, as by the time the presence of the insect is apparent, through the swelling of the stem, the damage is done. It has been stated, however, that the severance of the stem below the swelling and removal of all but the strongest sucker may result in a certain amount of useful leaf being produced. Whether this is carried out or not, infested plants should not be left untouched in the field, and if the season is too far advanced to replace the plant with a healthy seedling, the former should either be treated as above or burnt.

Tobacco Miner or Splitworm (*Phthorimæa operculella*, Zell.), Plate IV.—This insect is closely related to the

preceding, but the moth is darker coloured. The larvæ are similar, but the present pest chiefly attacks the leaves, and although found in the stems, is not known to produce any swelling. The "Splitworm" is the same species as the well-known "Potato Tuber-Moth," which bores into potato tubers in the store and in the ground, and also mines the leaves and stems of the plants, as in the case of tobacco.

The female moth lays her eggs singly on the plant. The eggs hatch in from six to ten days, and the young larvæ eat into the tissues. They eat out the substance of the leaf in irregular patches, leaving only the upper and lower skins. These patches are translucent when the leaf is held up to the light, and the caterpillars may commonly be seen inside the leaf. When full fed the larva spins a cocoon and changes to a pupa either within or outside the plant, the moth under favourable conditions emerging from thirty-five days after the hatching of the egg. The period of development, however, is affected by the temperature, and possibly the food. The figures given above were obtained from specimens bred in potato tubers; development in the leaf tissue of tobacco may possibly take somewhat longer. The important point is that several broods occur during the growing season, so that the pest increases rapidly in the field. One larva killed in December is likely therefore to prevent the development of a considerable number by April or May.

As tobacco is not at present grown for the purpose of making cigar wrappers in Southern Rhodesia, the injury to the leaves is not of the same importance as it is in some other tobacco-growing countries. The lower leaves of the plants are chiefly attacked, and where "priming" is carried out, many of the infested leaves are removed. Much good leaf is, however, liable to attack, and it is no uncommon sight in the barn to see hundreds of the caterpillars hanging by threads from the drying leaves, or crawling rapidly over the ground in endeavours to escape the uncomfortable heat.

In some seasons of very light rainfall this pest has done very serious damage both in unprotected seed beds and in the field. In these instances, which have been very occasional, the plants have been rendered practically useless over considerable portions of the land.

Control.—Keep the seed beds in as moth-proof condition as possible, and spray with arsenate of lead as recommended under "cutworm." Root out and destroy all weeds related to tobacco near the lands. These include the well-known "thornapple" or "stinkblaar" (*Datura stramonium*), the "False Cape Gooseberry," and others. Do not grow early potatoes or store potato tubers close to tobacco lands.

All "primings" should be destroyed at once by fire or burying deeply. If they are left in the ground the heat of the sun will cause the larvæ to leave them and seek the plants again. Infested leaves should be picked off and destroyed whenever practicable. In America labourers are sometimes sent through the lands to crush the caterpillars in the leaves by hand, and it is stated that this can be done fairly rapidly.

Some experiments carried out at Salisbury have resulted in considerable protection being apparent on plants sprayed with arsenate of lead (dry), 1 lb. in 30 gallons, with the addition of a spreader. Capex Spreader was used at the rate of 2½ ozs. in 30 gallons. Protection, although marked, was, however, not altogether complete, due apparently to uneven distribution of the poison over the surface of the leaves. The plants should be sprayed before they become infested, as there appears to be very little, if any, value in the procedure after the insects have once entered the leaf tissues.

Tobacco Budworm (*Chloridea obsoleta*), Plate V., Figs. 1, 2 and 3.—This cosmopolitan insect has received a variety of names in connection with its attack on different crops. It is the "Cotton Bollworm" of the cotton belt of America, the "Earworm" of maize and the "Fruit Worm" of tomatoes. It appears to be an annual pest of tobacco in this Colony, as elsewhere, being worse some seasons than others.

The eggs are laid on the heart, or later on the seed heads, of the plant, and hatch in three to five days. The caterpillars eat into the unfolding leaves. Later in the season they attack the seed-pods. The caterpillars vary in colour from pale green to various shades of brown, and may be quite plain or ornamented with stripes. Large specimens reach a length of nearly 1½ inches. When full fed the caterpillar enters the ground to pupate, emerging as a moth in from seventeen to twenty-seven days in the summer. Moths

pupating late in March frequently over-winter as pupæ, emerging in October, but another brood of moths commonly occurs in April and May. In one instance, out of six caterpillars which pupated in April, two moths emerged in May and four the following October and November. The broods are therefore not altogether regular, although the overwintering brood appears more or less regularly in October and November. The full life cycle of this insect has not as yet been followed in this Colony, but it has been worked out very carefully in the Southern United States, where the development from egg to adult has been found to occupy slightly over a month at midsummer, and from six to eight weeks in the spring and autumn.* It is probable that four or five complete broods mature in this Colony during the year.

Since the above was originally written experience in citrus orchards has indicated that the moths may emerge in numbers as early as late August, although such early emergence has not been recorded in the insectary at Salisbury. Whether irrigation of these orchards has any influence in this connection is uncertain, and further investigations are needed.

Control.—The pupæ in the soil during the winter are within reach of the plough, and if the land admits of the clods being broken up, as is usually the case with tobacco lands, winter ploughing, harrowing and rolling should do much to break up the pupa cells and crush or expose the pupæ. These operations should be carried out before September.

The usual practice in this Colony is to destroy the caterpillars by hand. Frequently this only needs to be done once, namely, during "topping" operations, but in bad years cases have occurred where the entire staff of natives has had to be utilised to save the crop.

A remedy for an allied species of similar habits, known as the true tobacco budworm, strongly recommended in the United States of America,† is powdered arsenate of lead, 1 lb. thoroughly mixed with 75 lbs. of finely-ground maize meal.

*E. Dwight Sanderson, "Insect Pests of Farm, Garden and Orchard."

†Farmers' Bulletin, No. 1531. United States Department of Agriculture.

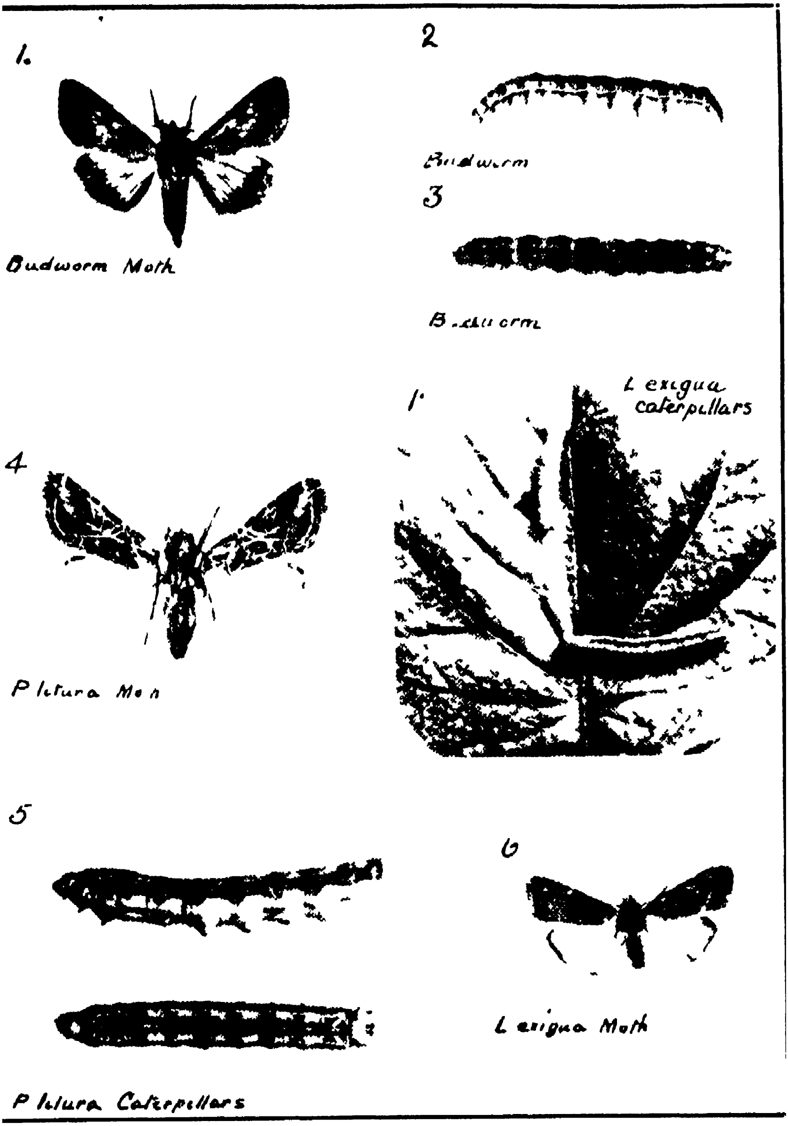

Budworm Moth
L exigua
caterpillars
L exigua Moth
P litura Caterpillars

Plate V

The mixture is applied to the buds by means of a tin perforated like a pepper canister and bound, with the perforated end downwards, to a short stick. The operation can then be performed very rapidly, the quantity used per acre being about 12 lbs. Dusting seed heads required for seed with pure arsenate of lead powder is a good practice.

Other Caterpillars.—Tobacco is sometimes attacked in the seed beds by the Pigweed Caterpillar (*Laphygma exigua*, Hübn.), Plate V., Figs. 6 and 7, and by the Tomato Caterpillar (*Prodenia litura*, Fb.), Plate V., Figs. 4 and 5, the former being the commoner pest. *L. exigua* may also prove injurious in the field. Both these insects are rapid breeders, passing through several generations during the year. The eggs are laid in clumps on the food-plants and hatch in a few days. The caterpillars feed upon the foliage and even the stems of the plants, those of *P. litura* having something of the habits of cutworms, lying hidden at the base of the plant during the heat of the day and feeding at night. Both species pupate in the soil. The moths are nocturnal in habit.

Control measures lie in keeping the seed beds as moth-proof as possible, combined with spraying, as already recommended. Bad attack in the field may be met by spraying with either arsenate of lead (paste), 1 lb.—16 gallons, or (powder) 1 lb.—30 gallons. For applying the spray a knapsack pump fitted with a nozzle of the cyclone pattern is necessary. More than one is desirable if the acreage to be treated is at all extensive.

EXPLANATION OF PLATES.

Plate I.—Details on plate.

Plate II.—Details on plate.

Plate III.—Young tobacco plant injured by Stem Borer (*Phthorimæa heliopa*), showing position of gall or swelling, and sucker formed from below point of injury.

Plate IV.—Details on plate.

Plate V.—Fig. 1. Adult moth of *Chloridea obsoleta* ("Budworm"), natural size.

Figs. 2 and 3. Larvæ of *C. obsoleta* ("Budworms"), natural size.

Fig. 4. Adult moth of *Prodenia litura*, natural size.

Fig. 5. Larvæ of *P. litura*, natural size.

Fig. 6. Adult moth of *Laphygma exigua* ("Pigweed Caterpillar"), natural size.

Fig. 7. Larvæ of above on leaf, natural size.

(*To be concluded.*)

Citrus Fruit Growing in Rhodesia.

By G. W. Marshall, Horticulturist.

Introduction.—Five years ago an article bearing the above title appeared in this Journal, but in bulletin form it has for some time been out of print. Since that date a considerable amount of experimental and investigational work has been conducted throughout the citrus-growing countries of the world, and as a direct result we are now more conversant with the requirements of citrus trees than we were then.

The time, therefore, seems appropriate for writing up this subject again, and in doing so it is proposed to deal with all the important phases of the industry to enable the beginner to establish and maintain his small or large planting in the best possible manner.

Rhodesia has vast tracts of country suitable for the growing of citrus fruits, and the writer has been agreeably surprised at the excellent results obtained under a very wide range of soil and climate conditions. Citrus fruit trees have been successfully established in Rhodesia at elevations up to 6,000 feet, and the soils chosen vary from light sands to heavy loams, and the advice here tendered is based upon personal observations within the Colony, supported and enhanced by successful practice in citriculture in other parts of the world.

It will be of interest to prospective growers and an encouragement to those already established in the industry to know that good progress has been made during the past seven years. In 1921, 18,500 cases of citrus fruits were exported from Southern Rhodesia, this amount representing approximately one-thirteenth of the whole South African export, whereas during the season just concluded over 160,000 cases were exported, this amount representing one-sixth of the total estimated South African export for 1927.

During the 1921 season a crisis arose from the fact that sufficient shipping accommodation was not available. Fruit growers were acting as individuals and were quite unorganised, with the consequence that shipping companies had no central body with whom to deal. With the advent of organisation matters are rapidly righting themselves, and to-day Rhodesian fruit exporters have a live and efficient body in the Rhodesian Co-operative Fruit Growers' Association, Limited, working on their behalf.

In the Union of South Africa a central body known as the Fruit Growers' Exchange of South Africa, Limited, has been formed, and this body acts as a connecting link between the citrus exchange, with which the local organisation is affiliated, and the deciduous exchange.

In addition to the co-operative bodies already referred to, the Union Government has legislated to control the export of all perishable products. A control board has been appointed which represents all producers of perishable produce. The chief duty of this board is the allocation of the reserved or chartered shipping space proportionately to the exporters of perishable produce.

With the improved status of the fruit industry, which has been brought about by the growers forming properly organised bodies, the shipping companies are providing and offering more suitable accommodation, and the railways have definite bodies with whom they can co-operate.

The principal difficulties are rapidly disappearing, and if all fruit growers continue to work together for their own good there is undoubtedly a bright future for citrus growing in Rhodesia.

There are comparatively limited areas in the world where good commercial oranges can profitably be raised, and the planting of citrus groves where soil and water supplies are suitable is a venture which may well receive very serious consideration.

There are ups and downs in all branches of farming, particularly when seasons and markets are unfavourable, but the average net profits derived from well tended citrus groves are usually sufficient to warrant the undertaking.

If a sound agricultural venture is contemplated it is advisable to adopt a system of mixed farming in preference to depending entirely on one branch of agriculture, and as there is an ever-increasing consumption of citrus fruits brought about by extensive advertising and propaganda work, the citrus industry should commend itself to those wishing to augment their income.

Climate.—Southern Rhodesia with a few exceptions possesses a desirable climate for the successful growing of most citrus fruits. There are, however, three factors that require careful consideration, namely:—

Winds.
Temperatures.
Rains.

Wind.—There is little if any necessity to consider the wind factor during the greater portion of the year, as this Colony is singularly free from injurious wind storms during the months of November to July. In the remaining months of August to October the wind is fairly strong and consistent, and if adequate provision is not made to exclude these dry winds from citrus groves there is every reason to assume that the setting of the fruit that takes place at this season of the year will be adversely affected. What actually occurs in an unprotected citrus grove during this dry and windy period may be summarised briefly as follows:—

When citrus trees are in active growth during dry and windy weather the transpiration of moisture (through the plant's breathing pores) exceeds the absorption of soil moisture by the tree's root system, and when this occurs an excessive wilting of the young growth and newly set fruit will be the result. This wilting becomes more pronounced as the summer temperature increases, and must be prevented, otherwise a heavy drop of immature fruit will be the result, due to the re-absorption of a portion of the moisture content from the fruit by the foliage.

In a citrus grove well protected by wind-breaks the transpiration of moisture is considerably reduced during dry and windy weather, and the evaporation of soil moisture is also restricted, thereby enabling the trees to function in a normal manner. If our atmospheric moisture were high at

this season of the year the winds would not produce this excessive wilting and good crops of fruit could be expected even in unprotected groves. The humidity of the atmosphere along the eastern border is relatively high when compared with the rest of Rhodesia, and the further west we proceed from this area the greater becomes the necessity of providing suitable shelter for the groves.

Temperatures.—In the tropics this factor is generally of minor importance. Owing to our altitude, we experience a temperate to sub-tropical climate in most districts of the Colony, and these areas are ideal climatically for the production of citrus fruits on account chiefly of the absence of extremes in temperatures. In a few areas located at the lower elevations sun-scald is at times somewhat troublesome. This may be overcome to a marked degree by choosing a site for the citrus grove with a southern or eastern aspect, or when tall-growing trees are established on the western side of the grove.

Low temperatures must be considered occasionally, and citrus trees should not be planted at the highest elevations where severe frosts occur, nor along water courses or low-lying ground where the temperature may fall below 25° F. Many citrus varieties differ in their degree of resistance to low temperatures, and it would not be wise to establish some of them where the minimum temperatures fall below that stated. At or above this temperature there is little or no fear of injury occurring to the trees or fruit. It is undoubtedly an advantage to have slight frosts during the winter months. Low temperatures improve the colour of ripening fruit and retard the ravages of many insect pests, besides improving the physical condition of many soils.

Rainfall.—Rhodesia enjoys a summer rainfall ranging from an annual average of about 10 ins. along the south-eastern border, 20 to 25 ins. through the Midlands and western territory, 30 to 35 ins. or more over the higher elevations of the north-eastern areas, and occasionally 100 ins. or more along some of the mountainous regions of the eastern border.

Owing to the greater portion of the precipitation occurring during a comparatively short season (November-

March) it is unwise to establish citrus groves where irrigation is not possible.

Citrus growing countries experiencing a summer rainfall have many advantages over countries with a winter precipitation, the chief being the absence generally of any need to irrigate during the period of most active tree growth and fruit development. Further, a greater variety of suitable cover crops may be grown during the summer months, and the fruit also is harvested and marketed in the dry season and thus has better carrying and keeping qualities than fruit harvested during damp or wet weather.

Selection of the Site.—The most important factors to be considered when selecting a site for the establishment of a citrus grove are suitability in respect of:—

(a) Aspect.
(b) Soil.
(c) Irrigation possibilities.
(d) Shelter.
(f) Transportation of fruit.

If one or more of these factors are disregarded when selecting the site, poor and unprofitable crops of fruit may be the result.

Aspect.—The best site to select for the citrus grove is one with a gentle southern or eastern slope. Northern and western aspects are often undesirable.

The slope of the site should not be excessive if soil erosion is to be avoided during heavy rain storms or irrigation. The best slope for planting citrus trees will vary with the nature of the soil, but it should never if possible exceed one in a hundred.

Situation of Site.—If severe frosts or hail storms have been experienced in the vicinity of the site favoured, careful enquiries should be made, and if there is any likelihood of severe damage occurring from these causes the locality should be avoided. Fortunately the greater portion of Southern Rhodesia suffers little from either of these troubles, and they seldom need to be considered.

The soil must be suitable for citrus trees and must be capable of being irrigated, preferably by gravitation. The

site must also naturally be sheltered from winds or be capable of being sheltered artificially. Where possible it should be located near a good road or railway line.

Soils.—Citrus fruit trees are grown on a variety of soils throughout Southern Rhodesia, ranging from light sands to heavy loams. The yields, quality and keeping properties of the fruits produced on such a range of soils vary considerably, and if payable crops of high quality and good keeping properties are to be successfully produced, great care must be exercised in selecting the soil. Heavy soils are undesirable; they are difficult to work and the quality of the fruit they produce is often poor. The trees are also more susceptible to root diseases, particularly during wet seasons, when this class of soil is likely to become water-logged, though good quality fruit may be produced in such soils during dry seasons. The disadvantages of the heavy soils outweigh the few advantages they may possess, and they should be avoided if lighter soils are available. The best soil for the profitable production of citrus fruit is a light or medium sandy loam with good depth and drainage. Citrus trees will not tolerate wet and cold sub-soils.

Suitable soils as described above will furnish the trees with a large root-feeding area. The trees are capable of growing to a large size, living to a great age and producing large crops of good marketable fruit.

On shallow soils with impervious clay sub-soils or overlying solid rock, young trees may thrive and flourish for a few years, but when the tap roots encounter the objectionable sub-soil the trees will rapidly decline or die and prove a great disappointment to the owner.

If sandy loams are unavailable in any given locality it would then become necessary to select a medium loam which may be either grey, chocolate or red in colour. Heavier soils than these recommended should be avoided if best quality fruit is desired.

A simple classification of Southern Rhodesian soils suited for citrus culture is:—

(1) Alluvial sandstone formations.

(2) Medium texture granitic deposits.

(3) Contact soils of a sandy nature.
(These contact soils are usually located between two or more formations, chiefly granite and ironstone.)
(4) Medium loams.

The minimum depth of a good citrus soil must not be less than four feet, and it should be well drained naturally.

The root system of a citrus tree differs from that of many other trees, in that it develops both tap and lateral roots strongly. The tap root is well defined and strikes downward into the soil, whereas the lateral roots develop horizontally and they are frequently to be found within a few inches of the surface of the ground. These roots are often referred to as the drinking or feeding roots of the tree. See Fig. 1.

Early South African planters realised that their seedling orange trees would often only thrive up to a certain stage and then rapidly decline or die. Upon investigation it was usually discovered that the tap roots of the dead or unthrifty trees had encountered objectionable sub-soils. To overcome this trouble many of the subsequently planted trees were set in groves over a large flat stone, the idea being to deflect the tap roots and produce a secondary system of lateral roots. The object in view was defeated owing to the tap roots again striking downward immediately they came to the edge of the flat stones. This method of planting is still practised by a few of the older South African farmers.

During Dr. H. J. Webber's* citrus survey of South Africa in 1925 he was particularly impressed with the layered citrus trees he had seen in the Cape and Transvaal Provinces of the Union of South Africa. Many of these trees were of great age and in most instances had out-lived the seedling trees planted at the same time. As the layered citrus trees are devoid of tap roots this would possibly account for their longevity. Layered trees are more suited to the shallower soils, on which they are likely to prove a greater commercial success than seedling or grafted trees. For the variations in citrus tree root formation see Fig. 1.

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*H. J. Webber, Ph.D., D.Agr., Director, Citrus Experiment Station, and Professor of Sub-Tropical Horticulture, University of California, U.S.A.

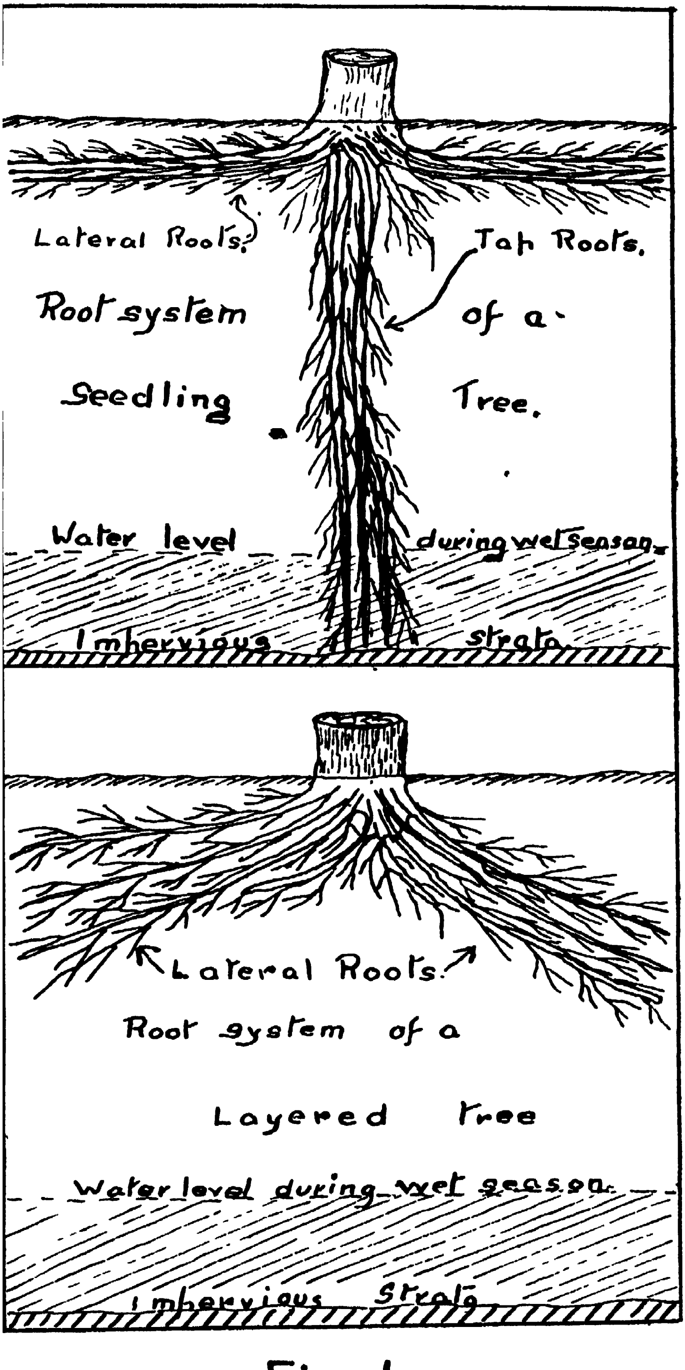

Lateral Roots.
Tap Roots.
Root system of a Seedling Tree.
Water level during wet season.
Impervious strata.
Lateral Roots.
Lateral Roots.
Root system of a Layered tree
Water level during wet season.
Impervious strata.

Fig 1.

Shelter.—Many old and unprotected citrus groves are to be found at the present time in South Africa. If the owners of these groves were to realise what their annual crop losses were on account of lack of shelter they would be astounded. While dealing with this subject it may be well to refer to what actually occurred on a Western Transvaal estate during the past few years. Nearly ten years ago an unprotected and grossly neglected citrus grove was acquired by its present owner, who immediately established shelter belts of rapid-growing trees round the groves; he also adopted modern manurial and cultural methods, with the result that the annual crops of fruit increased in seven years from 400 cases to 25,000 cases. This increase in crop production was most pronounced during the last three years, i.e., dating from the time when the citrus trees derived benefit from the rapidly growing shelter belts. The crops harvested were 11,000 cases in 1923, 17,000 in 1924 and 25,000 in 1925. The shelter belts protecting these groves were from 15 to 20 feet in height in 1923, and at the end of 1925 the same trees had attained a height of from 30 to 40 feet.

This instance of the increased crops of fruit harvested from the sheltered groves is an outstanding example of what may be done in the way of sheltering even old trees. These shelter belts were undoubtedly largely responsible for the greater portion of the increase in crop production, since on the few small sections where the citrus trees received inadequate shelter the crops were generally very poor, although all of the trees had received the same manurial and cultural treatment. One of the additional benefits derived from these shelter belts was the marked improvement in the outward appearance of the fruit, there being little or no mechanical injury throughout the adequately protected sections. Of all the fruit harvested, there was slightly under 3 per cent. of "culls"; most of this injury could be attributed to other causes than wind, the chief being thick-skinned and malformed fruits.

The citrus groves just referred to were inspected by Dr. H. J. Webber during his tour of investigation of the South African citrus industry. He was particularly well impressed with what he saw, and at the time stated that the trees were the best conditioned that he had so far seen in South Africa.

Reference has been made to the importance of providing suitable shelter for the groves where no natural protection is to be found. The following remarks will be confined to when, how and what to plant.

Having selected a suitable site for the grove, shelter belts, unless already existing naturally, should be established without delay. It is to the advantage of the citrus trees if shelter belts which are required to be established be planted a few years in advance of the grove they are to protect, as young citrus trees require protection from the time of first planting out if the best results are to be assured. This is not always feasible, however, particularly with new arrivals to the country who desire to establish groves without unnecessary delay. In instances such as this the shelter trees should not be planted later than the fruit trees they are to protect, and meanwhile rows of some of the more quick-growing temporary shelter plants such as dhal may be planted at close intervals around and through the grove to afford protection until the permanent shelter trees become effective.

The best time of year to plant all shelter trees is during the months of December and January; by planting at this season, when rains are usually frequent, it should be possible to establish the trees well before the dry season commences.

The preparation of the land for the grove and shelter belts should be effected at the same time if both the fruit and shelter trees are to be planted the same season. The soil should be deeply ploughed and brought to as fine a state of tilth as is possible. This preparation of the land is by far the most important factor in the successful establishment of a shelter belt. Many dismal failures in the establishment of shelter or other trees are often recorded, and upon investigation it is usually found that little attention had been devoted to preparation of the soil, very small holes perhaps having been dug or the trees planted in a careless manner. The few trees that survive such treatment are generally stunted or weakened to such an extent that they fall early victims to the ravages of white ants or some other pest.

After the soil has been brought into the best possible condition the shelter belt rows should be pegged with the inner row parallel with that of the intended first row of

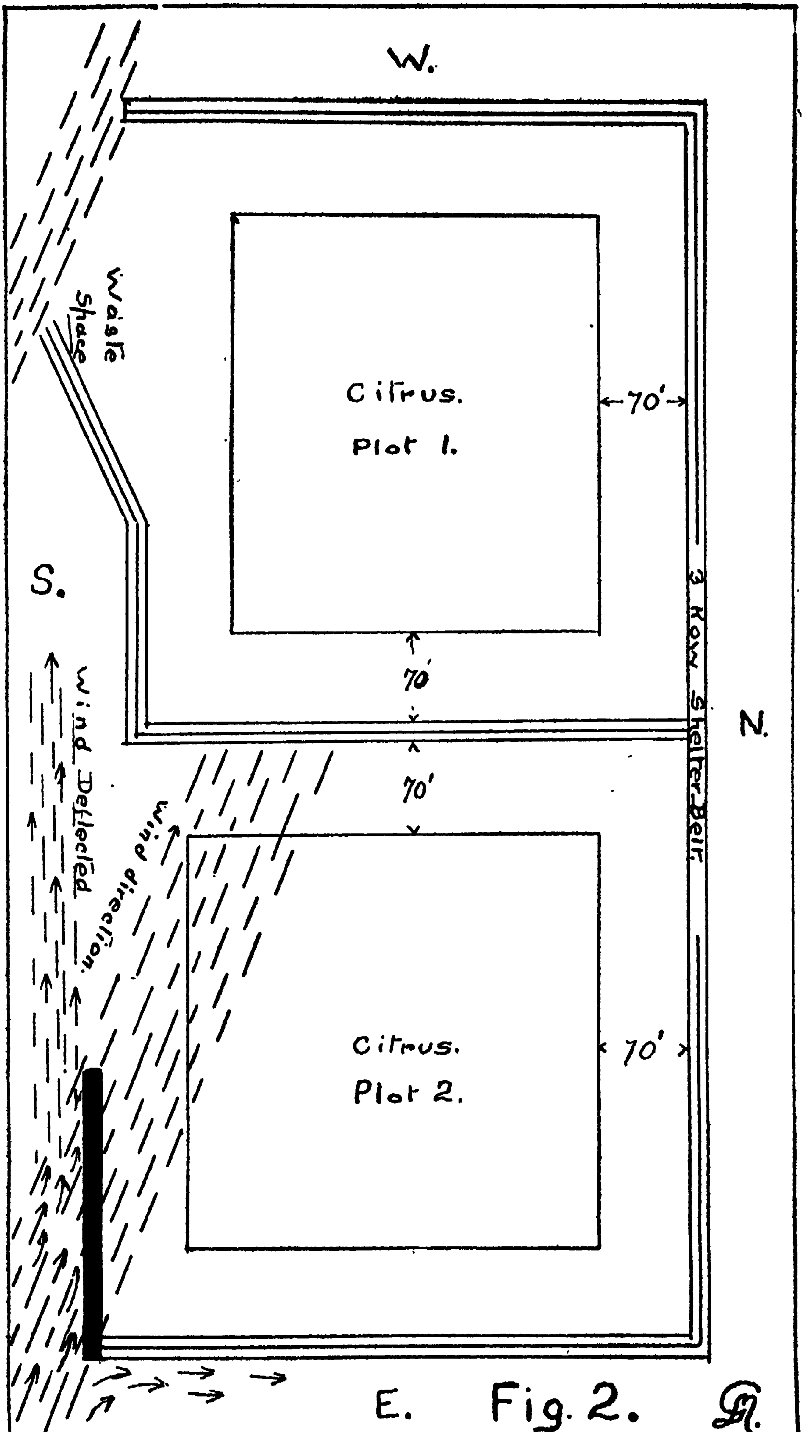

W.
S.
N.
E.
Waste Space
Citrus. Plot 1.
Citrus. Plot 2.
70'
70'
70'
70'
3 Row Shelter Belt.
Wind Deflected
wind direction.

Fig. 2.

citrus trees, but 70 feet distant. This row should be pegged according to the distance apart it is intended to space the shelter trees, this being usually 8 feet. Each subsequent row should then be pegged in such a manner as to have the trees alternating or three trees forming equilateral triangles. Each side of the grove to be protected should be pegged in the same manner, and the process will be the same if it be two or more rows of shelter trees.

In Fig. 2 a general lay-out of the grove and shelter belts is illustrated, and in Fig. 3 a corner of the shelter belt is illustrated to show the alternating three-row belt.

After the pegging process is completed the tree holes should be dug the same size and in the same manner as described under planting of the citrus trees.

All young shelter trees should be carefully lifted with a good ball of earth attached to the root system; if any bent or damaged root is visible it should be carefully cut out before planting. The small trees may then be set into their permanent positions at the same depth as they originally stood in the tins or nursery beds. After filling in the necessary soil the trees should be well firmed and watered if weather conditions render it advisable.

Cultivation should be given to the soil round each tree after each watering or during dry spells between the rains. This is extremely important, as it keeps down weed growth, conserves soil moisture and allows the trees to grow unhindered. If the necessary care and attention are paid to the young newly-planted tree it should be possible to secure an even stand of uniformly well-grown trees to furnish the required shelter.

The sides of the citrus grove that require most shelter are usually the north-west and east and a projecting south arm of one-third to one-half of this side.

In Fig. 3 the southern arm is depicted by a black bar. This additional shelter will protect the whole grove from the south-east winds, as it assists in deflecting the wind from the otherwise unprotected south-western corner of the grove.

When the shelter belts are arranged as suggested for plot No. 2 (Fig. 2), the citrus trees will be protected from both the south-east and north-west winds, sun injury will be

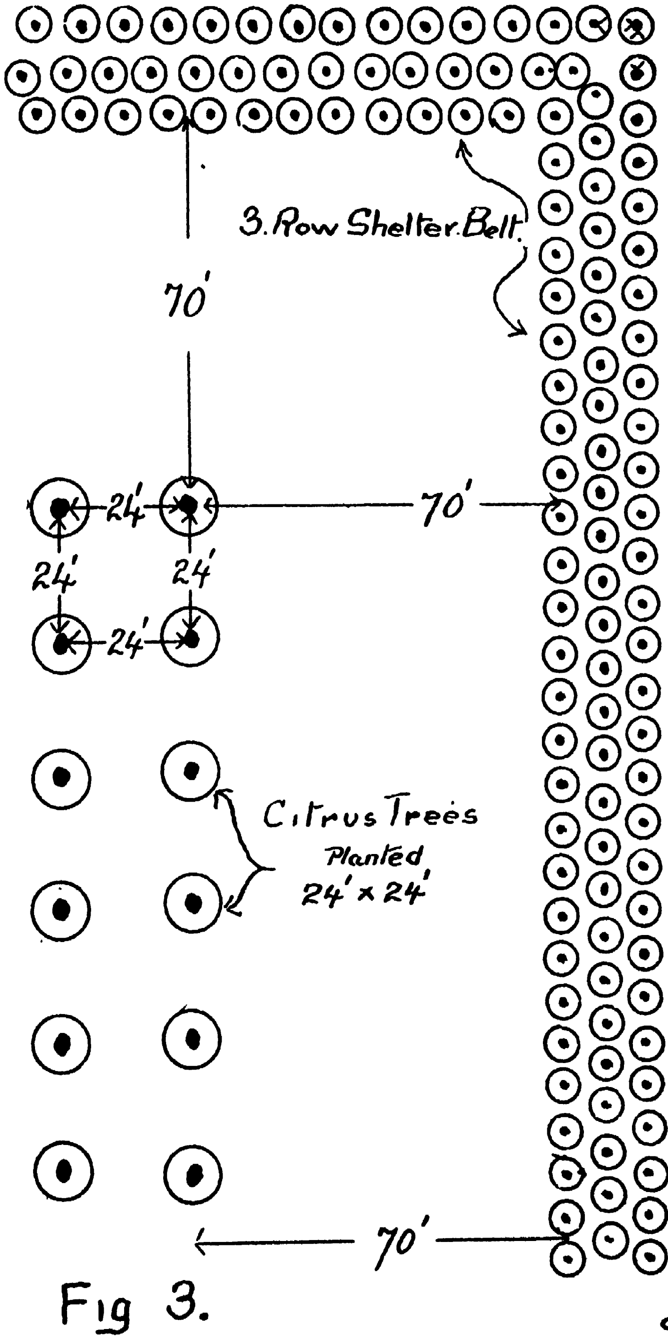

3. Row Shelter Belt.
70'
24'
24'
24'
24'
70'
Citrus Trees
Planted
24' x 24'
70'

Fig 3.

minimised. and the necessary air drainage will remain unaffected.

With plot No. 1 (Fig. 2) it will be noticed that an additional shelter arm is provided running south-west-west. Since this means more waste space with this method, the system is not advised.

It is an advantage to plant three or more rows of shelter trees if the maximum amount of protection is to be secured. The outer rows should be rapid, tall-growing trees and the inner rows trees of a bushy habit of growth which are usually slower growing. All of the trees may be spaced in rows 8 feet apart with 8 feet between trees. The wide space between the rows will permit of better cultivation and allow the root systems more feeding space.

The shelter belt should not be so dense as to stop all wind completely; a certain amount of air should pass through the trees, thus acting as a cushion for the wind which has been lifted overhead by the shelter belt.

The varieties of trees recommended for shelter belts are:—

Tall-growing trees for outer rows: Eucalyptus tereticornis and Eucalyptus saligna; the latter do best at the higher elevations.

If eucalyptus trees are objected to and the soil is sufficiently sandy, Pinus insignis will be found suitable for the outer rows.

For the inner rows Callitris calcarata, Callitris robusta, Cupressus torulosa and Cupressus lusitanica may be planted, but the latter only where the rainfall is heavy or irrigation is possible.

Many other varieties are suitable and may be planted, but those specially mentioned will furnish a sufficiently wide range to select from for average climatic conditions.

Fig. 4 illustrates a eucalyptus shelter belt which is devoid of undergrowth and is planted too near the grove; note the trench dug to sever the encroaching roots; this trench should have been filled in at once (undesirable shelter).

Fig. 5 shows a desirable shelter of cupressus.

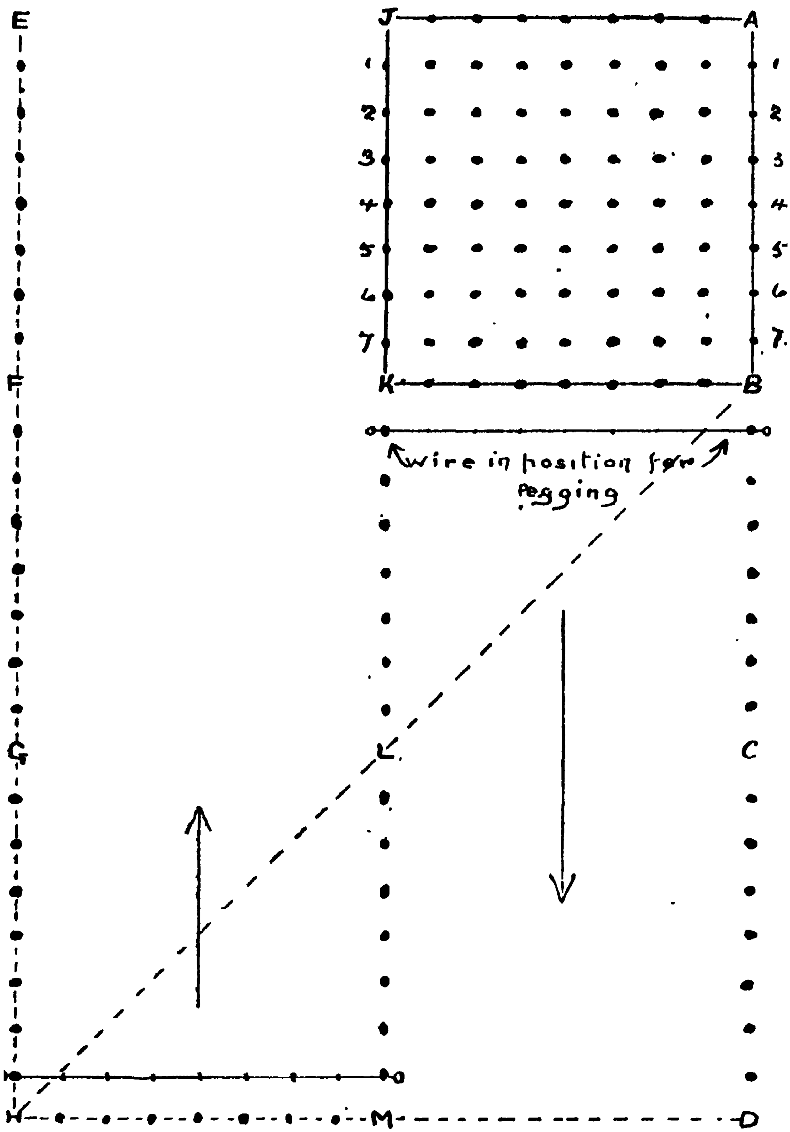
If the trees in Fig. 4 had been planted on the outer side of this belt a perfect combination would hàve resulted. The cupressus trees are too near the orange trees.

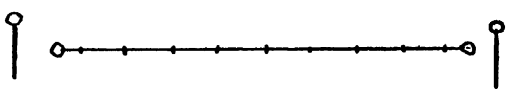
Preparation of Land.—The ground should be deeply ploughed and brought into good tilth; this is possible if performed toward the end of the rainy season—about March. When the ground is prepared at this season most of the soil moisture will be conserved and the later operation of digging the tree holes will be made easier.

It is also necessary to give the most careful attention to the problem of how to irrigate the proposed site of the grove. The advisability of grading the land before the trees are planted cannot be too strongly emphasised, as the efficiency of the irrigation scheme so much depends upon the proper grading of the situation. After grading, the whole area should be re-ploughed, cultivated and brought into the best possible condition, and if it can be arranged a trial irrigation should be given to ascertain which fall will be most suitable for planting the rows. The rows should preferably be short, with not more than 15 trees to each row. Such rows would be 120 yards in length and the fall should be about 6 inches per 100 feet, according to the nature of the soil, sandy soils requiring a greater fall than those of a medium or heavy character.

When trees are planted on an ungraded soil continuous trouble will confront the grower, and as it is neither easy nor economical to grade the slopes of an established grove, this work should be done prior to the planting. The additional cost of a properly graded site is more than justified on account of the ease with which all of the cultural and irrigation operations may be performed. On ungraded slopes the trees will receive irregular supplies of water, and this in turn will necessitate more frequent irrigation, while additional labour will be necessary to control the irrigation water. Depth of ploughing will also be uneven; silting will occur in the depressions, thereby endangering the health of many of the trees, and the texture or quality of the fruit may be adversely affected.

Laying out the Grove.—After preparing the chosen site in a thorough manner it should be carefully laid out with





Planting wire & pins.

Fig 6.

GM.

the rows of trees planted along the contours, allowance being made to permit of the irrigation water flowing evenly without displacement of the soil. The necessary appliances for the pegging out of the site are:—

Planting wire to set nine tree pegs at a time (68 yards). For this purpose No. 16 galvanised plain wire could be used, and lumps of solder or rings of wire should be connected at the distances apart it is intended to space the trees. A 3-in. ring must be attached to each end of the wire 6 ft. from the end solder mark. This facilitates the adjusting of the wire to its exact position when the pegging operation is proceeding. Two ½-in. iron pins 24 ins. in length will be suitable to hold the wire in position while the marker pegs are being set. Sufficient white wooden pegs or Spanish reeds 12 ins. to 18 ins. in length and about 1 in. in diameter should be available to allow of using three pegs for each tree to be planted. A few 3-ft. pegs are also necessary for setting the corner and wire length main pegs. These pegs are represented by letters in Fig. 6.

The systems for the laying out of groves and orchards are:—

(1) The square or rectangular.
(2) The hexagonal or equilateral triangle.
(3) The quincunx.

Of these, the square or rectangular method is recommended for adoption in Rhodesia where land is inexpensive. This square system facilitates all cultural operations, chiefly on account of the wider middles (space between the rows of trees). It permits of ploughing and cultivation being carried out in four directions, and each tree has a greater root-finding area than that obtained in other systems of planting.

The hexagonal or equilateral system of laying out a grove will allow of more trees being planted to the acre, 86 trees being necessary for the hexagonal as against 76 trees for the square system. The hexagonal system of planting has one great disadvantage as compared with the square system, in that ploughing and cultivation can only be done in three directions.

The quincunx system is only of use where temporary trees are to be planted among permanent ones. The lay-out

of this system is the same as that of the square system, but with a fifth tree in the centre of each four permanent trees.

If a mixture of citrus and paw-paw trees is desired this system will be found ideal. Paw-paw trees being short-lived, they may be used as the temporary fifth tree and then rooted out when the citrus trees require additional space. The square system of planting being considered to be the most suitable for Rhodesian conditions, there is no necessity to deal further with the other systems referred to.

Many writers in the past, in dealing with the pegging process, have recommended the setting of right angles at one or more of the corners. This is difficult to do accurately without expensive appliances, and to overcome the likelihood of repeated failures occurring in the process a simplified method is illustrated (Fig. 6) and may be described as follows:—

This system is better adapted for the laying out of groves planted on the contour where the corners need not form true right angles.

In Fig. 6 the first row A B C D (having the necessary uniform fall for irrigation), being the longest side, should be chosen to form the base line. This line should be completely pegged at every mark on the wire, using 3-ft. pegs at each end mark and shorter pegs between. In the illustration of this figure, letters represent long pegs and dots denote the short pegs.

When this base line is completely pegged the marking wire must be taken to peg A, where it is set at the angle the corner will form; if the shelter belt has been established, this will be simple, for both the base and side lines should be spaced 70 ft. from the shelter belt. The nearer the corner at A approaches the right angle the better. Having decided the direction this line will take, place the marking wire in position with the first solder mark against peg A, then draw the wire taut and set peg J at the furthest mark from A. The peg A end of the wire must then be taken round to K, where peg K is to be set, the J end of the wire being taken to peg B and the distance between K B corresponding with the two end marks on the wire; if not, peg K must be adjusted to the correct position. When pegs A B K J are accurately set, transfer the marking wire to set peg E, which

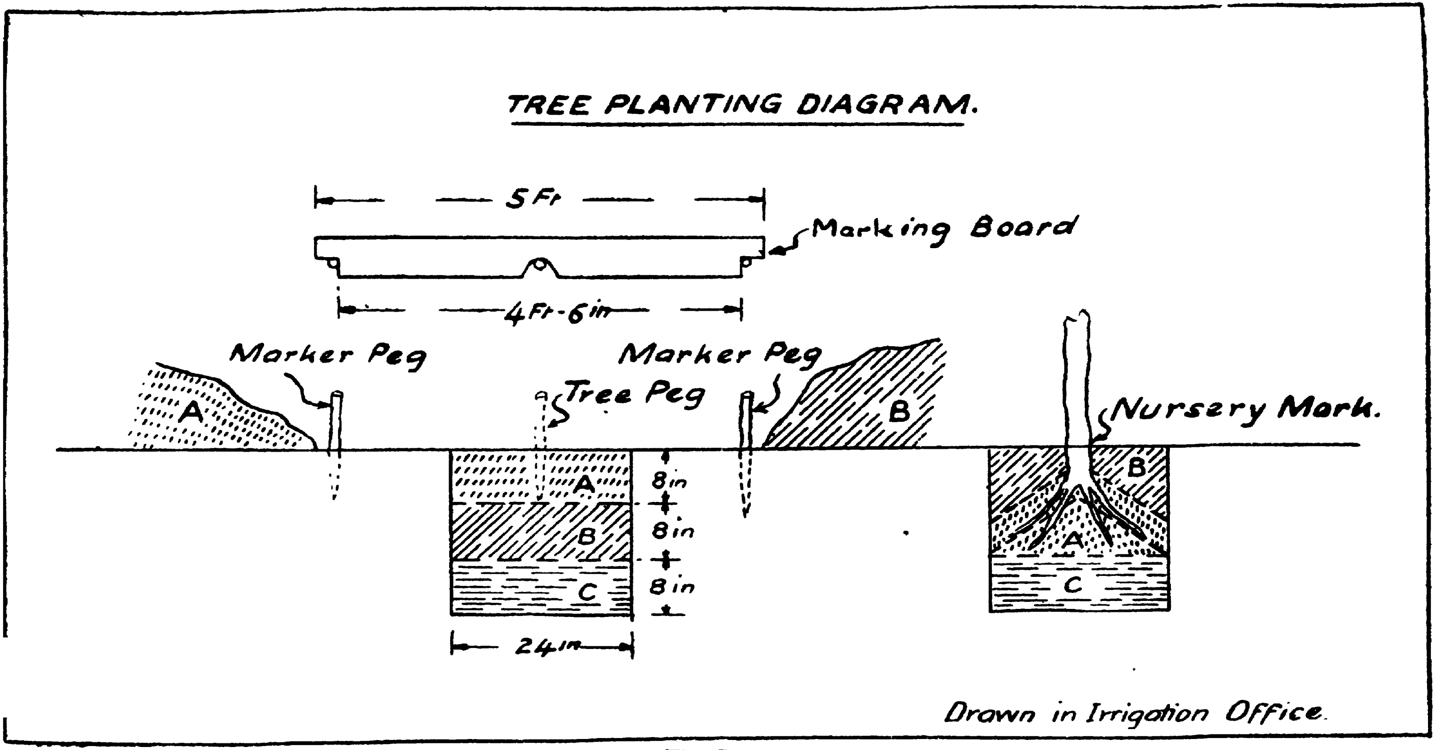
may now be sighted on pegs J A. Repeat the process and set peg F in line with pegs K B. Take the F end of the wire to peg L, which is to be set in line with K J. Transfer the wire to F G. Set peg G in line with F E and move the wire to G H and set peg H in line with G E F. Then set the last peg M in line with L K J.

Having completed the 3-ft. pegs, proceed to peg H and sight it first on pegs G F E, then on the diagonal pegs L B, and lastly on pegs M D. If each of these sets of pegs is in perfect line the whole area will be accurately pegged when completely filled in with the small pegs. Next transfer the wire to J K and set the seven short pegs (1 to 7). Repeat the process between K L, L M, H G, G F and F E. This completes the pegging of the three main lines. Now set the wire between pegs A J and fill in the seven small intervening pegs. Repeat the process between 1 1, 2 2, 3 3 and so on until the pegs D M are reached. Cross over to pegs M H and continue filling in until the last row J E is reached. This will complete the whole area. Any size or shaped piece of land may be pegged by this method.

When setting the short pegs (filling in), the marking wire ends must be placed in front of the end pegs already set, and all of the short pegs set on the side opposite to the direction the wire is travelling. This will prevent pegs being dragged out each time the wire is moved.

Distance Apart to plant Citrus Trees.—Citrus trees should never be planted nearer than 24 ft. apart each way, and this distance applies to all varieties of citrus. If seedling orange trees are to be planted it would be advisable to space them 30 ft. apart owing to the large size to which they will grow. The spacing recommended will provide each tree with sufficient room to grow unhindered, and each tree will have a large root-feeding area. Green crops also will receive more sunlight, and ploughing, cultivation, spraying or fumigation will be made easier.

Digging the Holes.—After the area is completely pegged, and if it is intended to dig the holes at once, the whole site must be double pegged to permit of digging the holes where the tree pegs stood. This pegging is simple, and if a suitable marking board is made, as illustrated on



TREE PLANTING DIAGRAM.
5 Ft
Marking Board
4 Ft-6 in
Marker Peg
A
Tree Peg
Marker Peg
B
Nursery Mark.
A
B
C
8 in
8 in
8 in
24 in
B
A
C
Drawn in Irrigation Office.

Fig. 7.

Fig. 7, the area may be accurately pegged without difficulty. This second pegging may be commenced from any corner of the site and can be continued row by row until completed.

Place the central notch of the marking board close against the tree peg, then set the two marker pegs in the end notches of the board, which may then be moved to the next peg, where the process is repeated, until the site is completely double pegged. The tree pegs may be left standing, as it assists the hole digger to locate the exact spot the tree is to occupy.

All tree holes should be dug if possible several weeks before the planting of the trees is begun, and when this is possible the holes should be refilled with good soil soon after digging is completed to permit of the earth settling down and thus eliminating the danger of the trees sinking too deeply, as is often the case where trees are planted immediately after the digging of the hole. The size of the holes for the trees should be at least 2 ft. square and 2 ft. deep.

The digger must first mark the size of the hole round the tree peg before withdrawing it. He should then dig out 8 ins. of surface soil and place it on a side unoccupied by a marker peg. The second 8 ins. of soil is then placed on the opposite side of the hole and the bottom 8 ins. of soil is loosened and left in the hole. This procedure is best for soil of good depth and quality.

If the sub-soil be inferior to that of the surface soil the first 8 ins. of soil should be placed as previously suggested and the remaining 16 ins. be dug out from the hole and discarded, the hole being then two-thirds refilled with good surface soil collected from near by and the 8 ins. of surface soil previously taken out being used to complete the filling.

Propagation.—Every orchardist should know how to propagate fruit trees; the knowledge will enable him to re-work unprofitable trees that he may have to a variety suited to his immediate locality.

The methods employed in order to raise fruit and other trees may be classified as follows:—

Seedage, cuttage, layerage and graftage, under which classification is also included budding. Of these methods

of propagation, budding is the most important and will be dealt with more fully than the other methods referred to.

Seedage, or the raising of plants from seed, will be described briefly when indicating the methods employed in raising lemon stocks on which the other desired varieties of citrus fruit are later to be budded. Since the rough or Mazoe lemon is at the present time the stock most suited for Rhodesian conditions, there is no necessity to discuss other kinds of stock.

The term stock is commonly used to denote the root portion of a tree, while the word scion indicates the piece of wood, shoot or bud that will form the top or head of the tree.

Propagation by means of wood or root cuttings is of little or no value for citrus fruits, and since it is not recommended, there is no necessity to deal further with it here.

Layering is to be commended when it is desired to raise special trees for certain classes of soils or when any particular variety is difficult to raise by the other methods of propagation.

The process of layering is simple and a brief description will suffice. Fig. 8 illustrates layering, and it will be seen that by cutting a lateral branch on the selected tree as shown at point (a), together with a second but diagonal cut made about two-thirds through the branch at point (b), the cut branch can be bent into position and pegged firmly to the ground under the tree. A mound of well prepared soil is then placed over the pegged cut end, and if the soil is kept moist, roots will form at point (b). When these roots are sufficiently well developed to support the new tree it may be detached from the parent plant and planted in its permanent position. Layered trees produce fruit identical to that borne by the parent plant.

Graftage may be divided into grafting and budding. With the former there is only one style that can be recommended for citrus, namely, "inarching." When the bark of the main stem has become damaged or diseased near the ground, or should the stock itself be unsuitable, the trees may be saved or the stock changed by this inarching method. Two or more lemon seedlings about the size of that marked 1,

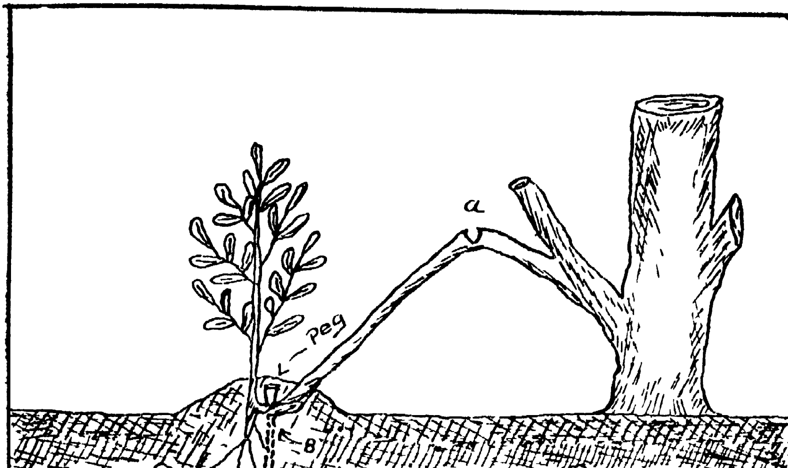


Fig. 8. Layered Branch.

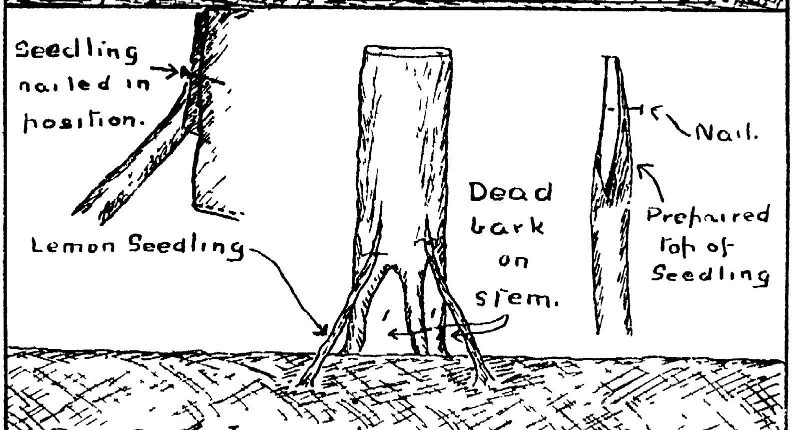


Fig. 9. Inarching.

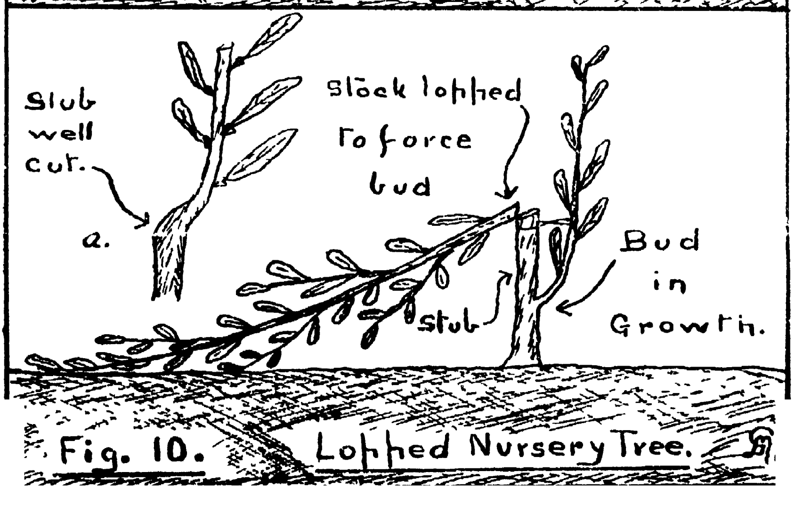


Fig. 10. Lopped Nursery Tree.

Fig. 14, which at 18 ins. above ground is about the thickness of a lead pencil, should be planted about 9 ins. from the stem of the tree to be inarched. Four stocks may be planted at the base of a large tree if the damage is considerable. These lemon stocks must be carefully planted and cared for, and then when they become established they should be cut back and grafted to the main stem of the tree, as shown in Fig. 9.

The bark of the tree stem is slit, as will be described later under budding. Cut the top of the lemon stock diagonally and allow a good taper; then insert the tapered end under the bark of the main stem of the tree. The cut surface of the stock must rest evenly on the cambium layer or outer surface of the woody portion of the stem, being nailed there to hold it in position; the loosened buds of the bark will assist to hold the stock in place. The treated area of the stock and tree stem is then covered with grafting wax to exclude all air, and within a comparatively short period a union will be effected between the lemon seedling and the tree trunk, and the necessary nourishment will be conveyed to the tree by the inarched lemon stocks.

Budding.—Shield or inverted T budding only will now be described, as it is the simplest and most universally adopted method of citrus propagation.

The procedure to follow when raising trees by this method of propagation is as follows:—Secure a sufficient supply of rough or Mazoe lemons, and about July plant the seed of the freshly collected fruit in a well prepared seed bed such as that used for raising tobacco seedlings. Place the seeds in rows 6 ins. apart with 1 in. between the seeds, the pips being covered with sandy soil to the depth of about half an inch. Then water whenever necessary with a fine-rosed watering can until the seedlings are large enough to plant out in the nursery; care must be exercised that the seeds do not dry out before or after planting, for if they do they will speedily lose their germinative properties. The best germination is obtained when the seed beds are bordered with brick and covered with tobacco seed bed covering. If the seed is planted in a warm and sheltered spot during July, germination should be completed in a month. Lemon

seed is polyembryonic, and many more plants may be raised than the actual number of seeds planted. If the seed is planted in rows as suggested, cultivation will be easy, weeds can be kept down and the seedlings will not crowd each other unduly. Lemon seedlings damp off badly, but this may be overcome by keeping the covering over the seedlings during the heat of the day until the rains commence. The seedlings should then have grown out of the damping off stage.

When the surface soil of the seed bed shows signs of drying after watering, it must be loosened to check weed growth and restrict the evaporation of soil moisture. Cultivation also, by encouraging ingress of air to the soil, restricts damping off.

When the lemon seedlings are from 6 ins. to 9 ins. in height (about November) they may be lifted and planted in the nursery, which should have previously been well prepared. As the seedlings are lifted from the seed beds the healthy and well grown ones must be sorted out; the rest, including those with bench (twisted) roots, being discarded. Shorten back the roots of those selected for planting to about 4 ins. and cut back the tops by one-half their growth. Then plant into rows in the nursery, spacing the plants 12 ins. apart in the rows and 3 ft. between the rows. Choose a dull day for this operation and protect the roots of the seedlings from wind and sun while transplanting. A simple manner of setting the plants in the nursery rows is by means of an ordinary spade, which, after being placed against the marking wire, is then pressed about 6 ins. straight down into the soil, after which the spade handle is pulled forward to make an open slit. The spade is then removed and the seedling is set at the same depth as it stood in the seed bed. It should be held by the top while one foot of the planter should be placed on the side of the slit furthest from the wire in order to press back the soil to close the slit around the roots of the seedlings. Finally, use the boot heel just against the small seedling and firm the soil thoroughly. A small amount of water may be given to each plant as it is set; the water will close any remaining air spaces near the roots. Such air spaces are objectionable, often causing the death of the newly set seedling. If no

rain falls within a week of planting the seedlings, they should be thoroughly watered. After each rain or watering the soil should be well loosened round the small plants; this not only checks weed growth and evaporation, but also encourages a rapid growth of the young seedling.

Soon after planting, a vigorous growth of side shoots will be thrown out along the stem from the ground level to the top of the plant. These shoots, with the exception of the topmost one, must be rubbed off while still small and tender; the shoots must be suppressed as they appear, since if left to grow out the stock will become bushy and unfit for budding in autumn. If the shoots will not rub off readily, procure a sharp knife and cut them off carefully close against the stem of the plant; badly trimmed and scarred stocks are difficult to bud, so any injury when trimming them should be carefully avoided. The stocks need only be cleaned to 12 ins. above the ground.

If lemon stocks are kept in active growth by careful tending, they should be fit for budding the following March or about five months after planting in the nursery. This rapid growth is quite possible in the well sheltered and warm valleys of the Colony.

Selection of Bud-wood.—Bud-wood or bud-stick are the terms used to define the small wood cuttings taken from trees from which it is intended to propagate. Having decided on the varieties of citrus fruits to be raised, the propagator should select or obtain bud-wood from trees known to produce heavy and regular annual crops of good, marketable fruit typical of its kind and possessing a thin, firm peel and with few or no seeds, according to the variety.

Other points to look for in the parent tree are yield of a high percentage of the popular selling sized fruits, good texture, flavour and external as well as internal colour. If the best bud-wood is to be collected, a careful record must have been kept of all the best bearing trees in the grove.

The most valued bud-wood on an orange tree is the small stem to which the fruit is attached. Often this is only one or two inches in length and very little thicker than an ordinary safety match; but if the terminal fruit is typical

of the variety and the tree is known to produce good crops of quality fruit, the twig should be cut and defoliated, leaving only small leaf stubs of about a quarter of an inch in length. As collected, such bud-sticks should be placed in a cool and damp cloth-lined covered box. If sufficient bud-wood of this particular type is unprocurable from the selected parent trees, good, healthy, round wood up to the thickness of a lead pencil may be taken; after cutting, treat it as recommended for the fruit-stem wood.

When the lemon stocks in the nursery have grown by the following autumn to the thickness of a lead pencil or a little larger, at about 9 ins. above the ground, and provided the bark slips readily (is not firmly attached to the wood), budding should at once be proceeded with. If the bark of the lemon stocks has a tendency to adhere to the wood, the nursery should be irrigated about seven days before budding is commenced; irrigation will stimulate the flow of sap and the stock bark will then slip more freely.

A fine day should be chosen for budding if the best results are to be secured. Hot, windy and wet days should be avoided. As soon as the necessary materials—comprising a good, sharp budding knife, raffia for binding and a supply of bud-sticks wrapped in damp sacking—are in readiness, budding may be proceeded with.

The buds should be inserted in the stock from 6 ins. to 9 ins. above the ground level and on the side of the stock which faces east. Select a spot with a smooth and healthy bark at the correct height on the eastern side, make a vertical cut about one to one and a quarter inches in length and then a horizontal cut across the bottom of the first cut. If the back of the blade of the knife is held lower than the cutting edge when the second cut is made, the lips at the intersection of the two cuts will lift sufficiently to permit of the bud being inserted easily. Next take a bud-stick in one hand and the knife in the other, and cut through the bark half an inch above the bud, cutting towards the operator, but only sufficiently deep to cut away a very thin layer of wood along with the bark. If the cut is commenced at the base of the knife blade and the knife is then drawn forward diagonally to half an inch below the bud, the point

of the blade should be resting just under the bark; the thumb should now press the almost detached bud against the point of the knife blade. Lift the bud and detach it from the bud-stick, and continue to hold the bud on the knife blade. Insert the free or upper point between the lips at the intersection of the two cuts previously made in the stock, slide the bud up as far as is possible with the thumb-knife grip, take hold of the small leaf stem (retained when defoliating the bud-wood) and slide the bud up until it is completely covered by the bark of the stock, as is shown by diagram (d), Fig. 11.

When the bud is correctly set, take a strand of slightly damp raffia and bind the bud tightly, only leaving the leaf stub exposed; too much raffia is objectionable. About six complete turns is ample, and the tighter it is tied the better.

The stock should be examined ten to fourteen days after budding. If the leaf stub has fallen or detaches easily, the bud has united with the stock; firmly attached leaf stubs indicate the failure of the bud, and the stock should be re-budded.

At each examination of the stocks after budding all shoots arising on the stock between the ground level and 3 ins. above the bud should be suppressed. Any raffia cutting into the stock should also be removed and re-tied where necessary. When the buds are well united all of the remaining raffia should be taken off the stocks.

Waxed bands of about ⅜ in. in width may be used in place of the raffia if the budding season is at all wet. The buds that unite with the stock will normally remain dormant over winter, and when the stocks show signs of commencing growth in early spring (August) the stocks should be partially cut about 3 ins. above the dormant buds and bent over as illustrated in Fig. 10.

The dormant buds will now start into active growth, and when the bud shoots have grown to about 9 ins. in length they should be tied to the stock stub; this tying reduces the risk of breakage at the union, which at this stage is insecurely united with the stock. When the bud shoot has grown to 12 ins. or 18 ins. in height the partially detached top of the stock may be completely removed, since

the young bud will now be capable of utilising all of the plant food supplied by the root system.

To secure a good straight-stemmed tree the growing bud shoot (scion) must be tied with raffia to a straight, wooden stake about every 6 ins. apart. See Fig. 12. When the trees are about 3 ft. high, cut off the stock stub diagonally just above the union of the stock and scion. See Fig. 10 (a). The wound will then callus rapidly. The trees may be allowed to grow to a height of from 4 to 5 ft. and should then be headed back to 3 ft. above the ground. Many shoots will develop after this heading back; rub off those that appear between ground level and a height of 2 ft. up the stem, retaining five or six well spaced shoots on the upper 12 ins. of the stem. On no account should two shoots be permitted to develop from the same spot; double shoots are objectionable and they may result in the breaking of large limbs after the trees are in bearing.

When the retained shoots on the upper 12 ins. of the tree stem are well grown and the tree is again dormant, it will be ready to lift and transplant to its permanent position in the grove.

Top Working Unprofitable Citrus Trees.—The grafting or budding of large citrus trees is often unsatisfactory, and as it is easier to replace them with good young trees, large unprofitable trees should generally be rooted out. If the unprofitable trees are small to medium in size, they may be headed back very heavily and then be allowed to form a new head. This new growth must be thinned down to two or three shoots on each limb, and when these are sufficiently large they can be budded to the desired variety in the same manner as that already described for the budding of nursery stock. These buds should remain dormant over winter and then commence growth about August, after the shoots have been shortened a little. When the buds are well grown the stubs may be cut as previously recommended and the new head of the tree should, with good treatment, then grow quickly and possibly produce fruit the second season after top working. Fig. 13 illustrates an unprofitable Washington Navel orange tree top-worked to grape fruit one year after budding.

Ordering of Trees.—When a purchase of citrus trees for planting is to be made they should be ordered well in advance of the planting season. It is best to buy the trees from reputable nurserymen who raise good and healthy trees from selected parents. First-sized trees only should be used; smaller trees are often runts and seldom give good results. Fig. 14 (3) shows a good first-sized tree twelve months after budding. In Rhodesia first-sized trees may be produced in 12 months from time of budding, and at longest within two years.

Time of Planting.—Citrus trees may be planted at any season of the year, provided irrigation facilities are available and the trees are not in active growth. When only a few are to be put out, and assuming they are procurable, August is as good a month as any in which to plant. Given good attention and a full growing season, August planted trees will out-grow those planted later in the year. For extensive plantings, however, the rainy season should be chosen, for then there is less danger of mortality amongst the plantings. January and February are good times to plant if the trees are dormant. Trees planted in January will do better than those planted later, as they are more capable of withstanding any unfavourable climatic conditions which may occur during the succeeding winter.

Method of Planting.—On arrival of the trees from the nursery they should be placed in a shady spot and kept moist until planted. They should not be left any length of time in the boxes or tins in which they were packed, but should be heeled into a trench and kept there until wanted. The heeling-in process consists in digging a trench about 18 ins. in depth with one side sloping at an angle of about 45°. The trees are laid in not more than two deep, the soil being well worked in around the roots and the trench then being filled with soil and watered occasionally to keep the trees in good order.

Before planting is commenced it is well to be sure that all the necessary appliances are at hand. These are:—Marking board (previously used when double pegging), spades, sacking to protect the tree roots, secateurs to trim the tree roots and tops, Bordeaux paste and brush to colour-

wash the tree stems and a sufficient supply of water to water the trees when planted.

Everything being in readiness, a few trees are then taken from the heeling-in trench, the roots being wrapped in damp sacking. Proceeding to the first hold, have a small hole dug between the two pegs, then place the marker board side notches against the two pegs. Take a tree from the damp sacking and cut out the broken, twisted, damaged or diseased roots, shortening back those that are too long. All cuts should be made diagonally on the under side of the roots. Care should be exercised that the roots are not at any time during planting unduly exposed to sun or wind. Cool and overcast days are best for planting, but these favourable conditions are not always to be had. The stem of the tree is now placed in the central notch, with the upper roots almost touching the planting board; the soil is then filled in slowly, the roots being evenly spread in all directions and well covered. Now remove the marker board and shake the tree slightly with an up and down action; this will assist the finer soil particles to collect round the roots and fill any air spaces. A slight mound should next be made over the roots at the base of the tree, after which the soil should be firmed by tramping it well over the roots and up to the stem. Citrus trees must not be set too deeply; plant them no deeper than they stood in the nursery. This depth will be indicated by the nursery mark (junction of the yellow and green bark near the roots).

It is an advantage to keep the nursery mark 2 ins. to 3 ins. above the soil level; the tree will then be well planted, and as the soil subsides the tree will gradually sink to the nursery mark level. If the upper roots of the newly set tree are very close to the soil surface a small mound of loose soil may be placed over them; this will prevent any overheating or undue drying of the soil surrounding the shallow roots. This mound will gradually disappear with cultivation, but not before the tree is well rooted and no longer requires this additional protection. After planting, cut the top of the tree back, as is shown on Fig. 14 (3). Up to six well-spaced arms may be retained; the heading back of the tree will enable the reduced root system to feed the proportionately reduced top in a normal manner.

Many fruit trees are planted without cutting back the tops; this is wrong, and causes an undue demand on the root system, of which over half was left in the nursery at the time of lifting. The larger the tree, the greater the loss of roots at lifting. To counteract the loss of roots a proportional amount of the top must be cut away at planting.

The trees should be watered as they are planted with at least eight gallons of water to each tree, and more if the soil is very dry. The watering will settle the soil and at the same time supply the tree with the necessary moisture with which to revive growth.

The stems should be colour-washed with Bordeaux paste to prevent sun scald. When the surface of the soil is sufficiently dry after watering it may be lightly loosened again to check evaporation.

(To be concluded.)

The Use of Fertilisers and Manures in Southern Rhodesia.

By A. D. Husband, A.I.C., Chief Chemist.

The rapidly increasing use of artificial manures in this Colony is evidence of the fact that the farmer is realising that it is not only necessary to obtain crops that bring in more than they cost to produce, but that he must pay attention to the maintenance of the soil fertility and also endeavour by proper soil treatment to maintain or even increase the productive capacity of his land.

One of the first needs, however, in the use of commercial fertilisers is a knowledge of the general principles of crop production and the functions which the different manurial ingredients perform in the plant body.

The object of this article, therefore, is to attempt to state as briefly as possible a few of the main factors affecting soil fertility and the purpose and functions of manurial treatment.

Soil Fertility.—The main factors affecting soil fertility are:—

(1) The supply of plant food ingredients.

(2) The physical character of the soil.

(3) Water.

(4) Air.

(5) A suitable temperature.

It is essential that a fertile soil should meet the requirements of the plant in respect of the above factors. The farmer should therefore acquaint himself with the exact influence of each of these factors, and endeavour by manurial treatment to make good plant food deficiencies and by cultivation, drainage or by other cultural methods to remove any

harmful conditions that may be influencing the crop-producing power of the soil.

Loss of Fertility.—The removal of crops for a number of years on unmanured land, bad cultivation, erosion and leaching are all factors which may cause a loss of natural fertility. In all, ten chemical elements are recognised as being necessary for normal plant growth and development, but the number liable to rapid exhaustion by the removal of crops is generally limited to the three elements nitrogen, phosphorus and potash. This is due to the fact that these three elements occur in larger amounts than the others in most plants and that they are present in smaller amounts than the others in even the most fertile soils.

The loss of fertility due to bad cultivation is very often not fully realised, and many crop failures are probably due more to lack of proper soil preparation and subsequent cultivation than to a deficiency of plant foods. It has been proved that many soils not naturally fertile may be made fertile by proper cultivation. By cultivation the farmer can partially control the loss of water from the soil, render many of the unavailable plant foods available, partially check erosion and control weed growth. It should be remembered that the presence of the latter in arable land invariably results in a reduced yield, as the weeds absorb a considerable amount of both moisture and available plant foods which otherwise would be available for the crop, and further, the presence of weeds tends to harbour worm, insect, fungus and bacterial pests.

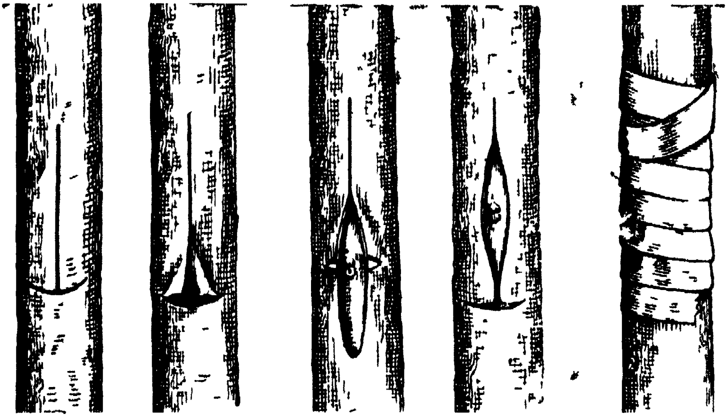
Manures.—Generally speaking, a manure or fertiliser may be regarded as a substance which, if added to the land, will increase the yield of the crop.

It has already been stated that the elements most liable to exhaustion in the soil are nitrogen, potash and phosphorus. The object of manuring should be, therefore, to furnish these elements to the soil.

These three are usually termed the essential manurial constituents to distinguish them from the others that are needed by plants, such as iron, sulphur, magnesium, etc., of which an ample supply is usually available in all soils. In addition to supplying these essential manurial ingredients,

Fig. 4. An undesirable shelter of eucalyptus trees with no under protection and planted too near the grove. The roots affect the first row of citrus. Note trench cut to destroy encroaching roots. Trench still to be filled in.

Fig. 5. Desirable shelter of cupressus. An outer row of tall trees would furnish better results. These trees are too near the citrus trees.



(a) (b) (c) (d) (e)

Fig. 11. (a) Incision on stock; (b) incision with lower ends of bark raised for inserting the bud; (c) bud partially inserted; (d) bud inserted ready to wrap; (e) bud wrapped with waxed cloth. (From Year Book U. S. Dept. Agr. 1896.)

Fig. 12. Young orange trees, about 1 to 2 feet in height, staked and tied

Fig 13 Unprofitable Washington Navel tree top worked to grape fruit One year's growth

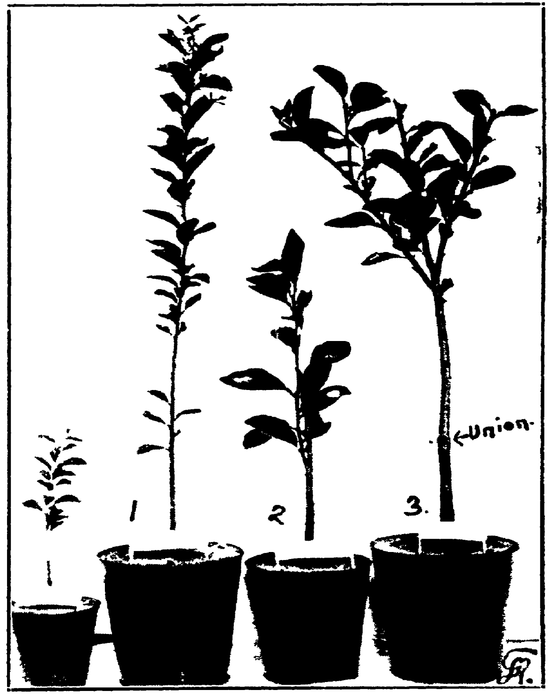


Fig 14 1 Lemon seedling fit to bud 2 Orange bud growing. 3 How to head back a tree at planting

many substances used as manures possess the function of improving the physical condition of the soil, thereby adding greatly to its fertility. The only two manures used in this Colony possessing this dual function to a marked extent are kraal manure and green manure, and the effect of these two substances on the physical condition of the soil is probably more valuable than their service as suppliers of plant foods. The effect of the vegetable matter on the physical condition of the heavy soils is to make them more porous, thus allowing air and water to penetrate more freely, and on sandy soils the organic matter fills up the open spaces, thereby increasing their water-holding capacity and making them more compact.

The chief distinction between what are known as fertilisers and what are known as manures is the difference in respect of this secondary function. The manure possesses the function of being able to supply the essential food constituents and to aid plant growth by improving the physical condition of the soil, whereas the fertiliser, as a rule, only supplies plant food.

There is a belief held by many farmers that all that is necessary to maintain soil fertility is the application of inorganic fertilisers, but any farmer following this practice will find eventually that he must apply organic matter to his land in order to maintain its productive capacity.

The fertilising value of animal excreta, stall litter and waste material has been recognised for centuries, and these materials should still be regarded as most valuable manures and every use made of available supplies. The best results will undoubtedly be obtained from the use of inorganic fertilisers, supplemented occasionally by the application of organic manures.

The Function of Essential Manurial Ingredients in Plant Growth.

Nitrogen.—This element is essential for the formation of protein bodies and is intimately connected with the development of leaf and stem of the plant. The effect of a nitrogen deficiency is generally characterised by stunted growth and yellowing of the leaf. Owing to the fact that nitrogen favours leaf development it is of particular importance for plants such as tobacco, cabbages and all grasses.

Potash.—This element promotes tone and vigour in the plant and tends to increase its power of resistance to bad weather conditions and disease. It also favours the formation of starch.

Phosphorus.—This element is essential to the growth of all plants; it promotes root development, early maturity and stimulates the development of young seedlings.

Special Nitrogenous Fertilisers.—Nitrogenous fertilisers for certain reasons should be used with more discretion than other fertilisers. In the first place the unit of nitrogen is much more expensive than the unit of potash and phosphorus, and further, excessive use of nitrogen may produce very undesirable results, or, if used at an unsuitable period in the growth of the plant, it may be lost. It has been mentioned that nitrogen favours leaf and stem growth, and for this reason the results of an application of a nitrogenous fertiliser can usually be seen with the naked eye. The effect of nitrogen on the vegetative portion of the plant is a factor with considerable importance in the manuring of a crop such as tobacco. It should be remembered, however, that excessive nitrogen produces a rank growth of heavy, dark-green leaves and considerably delays ripening. Another serious effect of excessive nitrogen is the production of a crop more susceptible to fungoid disease.

There are many inorganic forms of nitrogen on the market as fertilisers; the only ones used to any extent in Rhodesia, however, are nitrate of soda, sulphate of ammonia, nitrate of potash and di-ammonium phosphate. The two latter are used at present solely by the fertiliser firms in compounding highly concentrated fertilisers.

The form in which the nitrogen is present in a compound is of great importance in regard to its availability. In general the inorganic forms are much more readily available than the organic forms. Nitrogen is available as a plant food largely in proportion as it is converted to a nitrate by the nitrifying bacteria in the soil, and after it assumes this form it is not retained by any constituent of the soil and hence is very liable to be lost by drainage unless immediately assimilated by the crop.

Nitrate of Soda.—From what has been written it will be readily understood that the nitrogen in nitrate of soda,

being in the nitrate form, is immediately available as a plant food. This form of nitrogen is very rapid in its action and is particularly useful for stimulating growth past insect attacks. To avoid waste by leaching it should only be applied to a growing crop, and care should be exercised both in the method and amount of the application. Nitrate of soda should not be mixed with superphosphate or dissolved bones unless it is to be sown immediately.

On heavy clay soils this fertiliser, if used regularly, causes the clay particles to deflocculate, rendering the soil liable to puddle and more difficult to work. This deflocculating action of nitrate of soda cannot be remedied by the usual method of liming, but must be counteracted by the use of an acid fertiliser such as sulphate of ammonia.

Sulphate of Ammonia.—Sulphate of ammonia is prepared from the ammoniacal products derived from the destructive distillation of coal in gas works, and it is from this source that the main supply of this compound used for agricultural purposes is derived. In its crystallised form sulphate of ammonia is a highly concentrated fertiliser, containing as it does about 20 per cent. of nitrogen. Although sulphate of ammonia is soluble in water, its nitrogenous portion is fairly well retained by the humus and mineral colloids of the soil. The ammonia is oxidised to a nitrate before it is taken up by the plant, and as a considerable time may elapse before it is nitrified, it may be applied to the soil with the seed without fear of loss. The rate of nitrification of sulphate of ammonia is dependent on weather conditions and the supply of lime in the soil. The use of sulphate of ammonia is attended with some loss of lime to the soil, as the sulphuric and nitric acids formed on nitrification both unite with the lime of the soil-forming sulphate of lime and nitrate of lime, the former of which is carried away by the drainage and the latter is assimilated by the plant.

It will be understood, therefore, that sulphate of ammonia tends to make the land sour and must be used with caution on lands poorly supplied with lime, whereas on lime rich soils it is the most satisfactory nitrogenous fertiliser. Nitrification is usually retarded in dry weather and in soils deficient in lime.

Organic Nitrogen.—The sources of organic nitrogen are manifold, but the farmer in Rhodesia is chiefly concerned with Peruvian guano, bloodmeal and whalemeat, which are the three commonest forms of organic nitrogen sold in the Colony. As previously stated, nitrogen is available as a plant food largely in proportion as it is converted to a nitrate by the nitrifying bacteria in the soil, and therefore the form in which the nitrogen is present determines to a large extent its availability. The nitrogen in these organic substances is not present in a form suitable for plant food, and owing to the rate of decomposition of organic fertilisers being very variable, the whole problem of the feeding of plants with nitrogen becomes more difficult with the organic than the inorganic manures.

Generally speaking, bloodmeal, Peruvian guano and whalemeat will all give up a portion of their nitrogen fairly readily, whilst the remainder becomes slowly available in the soil and provides food for the later period of development of the plant.

From the information recorded above it will be understood why, for example, in tobacco fertilisers intended for use on light sandy soils, the nitrogen is contained in more than one form. Were, for instance, the whole of the nitrogen present in the form of nitrate the plant would only be able to use a small portion of it before it was carried away in the drainage and would then have nothing left to feed on after the first few weeks.

This rule applies generally, and the farmer is advised to arrange his manurial programme so as to supply nitrogen in both quick and slow-acting forms.

With regard to tobacco, however, a word of warning is necessary. On the heavier red soils which contain a fair amount of organic nitrogen it is not advisable to include organic nitrogen in the tobacco fertiliser. A soil rich in nitrogen receiving an application of a slow-acting nitrogenous fertiliser would tend to delay ripening considerably and may result in the spoiling of a promising crop. In most cases all that is necessary on such soils is a little readily available nitrogen to force the growth of the young plant past insect attack. For this purpose the nitrogen is best supplied either

in the form of nitrate of soda or sulphate of ammonia, or, better still, a mixture of these two salts.

There is one point of particular interest and importance to farmers relating to nitrogenous fertilisers, and that is their expense. The farmer must remember that when using these expensive active nitrogenous fertilisers he is studying the needs of the crop and not the soil.

The best and most economical method of supplying nitrogen to the soil is by the growing and ploughing in of leguminous crops. Legumes have the property of assimilating and storing the nitrogen of the atmosphere in their leaves and roots for their own use, and when these legumes are returned to the soil they not only increase the humus content of the soil, but also its nitrogen content. By the inclusion of a leguminous crop in the rotation the need for purchasing expensive nitrogenous fertilisers will be reduced considerably, and the beneficial results obtained in subsequent years will amply repay the cost and labour of putting down this crop.

The applicability of this treatment to soils in Southern Rhodesia has been clearly demonstrated by Mr. G. N. Blackshaw in his experiments on "Soil Treatment and Manuring for Maize Production."

Potash.—The need of soils for potash in this Colony does not appear so great as for nitrogen and phosphorus. The inclusion of a proportion of potash in the fertiliser is advisable, as it tends to give the necessary tone and vigour to the plant. The two commonest forms in which potash is supplied as a fertiliser are the sulphate and muriate. Both forms are equally available, and these salts, although soluble, are firmly retained in the soil; hence potash may be applied at any season of the year without fear of loss. It is generally believed that the chlorine in muriate of potash, if applied to a tobacco crop, adversely affects the burning properties of the tobacco, but although the evidence available is somewhat contradictory, it is perhaps advisable to keep to the sulphate for tobacco culture until more definite information is available. Leguminous crops, potatoes and all grass lands have been found to be particularly benefited by applications of potassic fertilisers.

Phosphates.—Generally speaking, the soils in this Colony are very poorly supplied with phosphorus, and applications of any phosphatic fertiliser are almost certain to exercise a favourable influence on both the yield and quality of the crop being grown.

Phosphorus plays an important part in plant life and occurs in greatest quantity in the reproductive parts of the plant. Owing to its stimulating effect on root development and the fact that it hastens maturity, phosphorus has a particular influence on shallow-rooted plants which have a short period of growth.

Phosphoric acid occurs in nature in combination with different metals which are termed phosphates.

From an agricultural standpoint the phosphate of most importance is phosphate of lime, and it is from this form that the phosphoric acid used in the manufacture of artificial manures is mainly derived.

Phosphate of lime is present in varying amounts in all fertile soils, being derived from the disintegration of rocks. From the soil it passes into the vegetable kingdom, and from the vegetable into the animal kingdom, where it plays as essential a part in animal life as it does in plant life. Phosphorus is found in all parts of the animal, but chiefly, of course, in the bones, which contain about 60 per cent. of phosphate of lime. Bones therefore form the chief source of phosphate in organic combination and were for a long time the main source of phosphates for manurial purposes.

Mineral Phosphates.—The mineral phosphates form a class of products differing from those of animal origin mainly in the fact that they are more dense in their structure and are not combined with organic matter.

The rate of decomposition of rock phosphate is much slower than that of bone phosphate, because there is no organic fermentation and the material only becomes available by the action of weathering and solvent substances in the soil. Another factor affecting the rate of availability of rock phosphate is the proportion of iron and aluminium it contains, as the phosphates of these metals are more slowly attacked by the soil solvents than phosphate of lime. It

must not be assumed, however, that raw phosphate rock has no value as fertiliser, for, on the contrary, these phosphate rocks have been proved both in this Colony and abroad to produce very good results, particularly on certain types of soil. In using phosphate rock it is essential that the rock be in as finely ground a state as possible and that it be applied as early as possible, preferably before the first ploughing, and well worked into the soil. If attention is paid to these two points it will be found in many instances that a good response is obtained and financially there is a big saving compared with the use of superphosphate.

Superphosphate.—The mineral phosphates constitute the source of supply for the manufacture of commercial superphosphate. The purpose of the conversion of rock phosphate to superphosphate is to render the insoluble phosphate to a form which is soluble in water. Chemically speaking, phosphate of lime may exist in various forms, the form in which it exists determining its solubility. Phosphate of lime or tricalcium phosphate is the form occurring in bone or mineral phosphates, and this consists of three parts of lime to one part of phosphoric acid. This form is insoluble. Superphosphate or monocalcium phosphate consists of one part of lime to one of phosphoric acid. This form of phosphate is completely soluble in water.

A third form of phosphate of lime is termed dicalcium or reverted phosphate. The term "reverted" means a going back from the soluble towards the insoluble form, and "reverted phosphate" contains two parts of lime to one of phosphoric acid. This form of phosphate is insoluble in water, but is soluble in a dilute solution of ammonium citrate and is also believed to be soluble to the roots of plants.

The sum of the soluble and reverted forms is called the "total available" because these are regarded as immediately useful to the plant, whereas the total phosphate refers to the sum of the whole three forms.

The phosphoric acid in superphosphates, though soluble in water, is very firmly retained in the soil. Superphosphate, on coming in contact with the soil, reacts with the lime and other minerals present and forms insoluble phosphates. It is believed that the major portion of the superphosphate combines with the lime, forming the dicalcic or "reverted"

phosphate, and later perhaps some of it forms the tricalcic form. The time required for the fixing of the phosphoric acid as well as the form it assumes depend to a great extent upon the character and composition of the soil. In no instance is fixation immediate, but in most cases it is undoubtedly completed in the course of a few days, and fixation is most rapid in soils rich in lime.

The advantage attached to soluble superphosphate is that it is well distributed in the soil before it passes into the insoluble form. Every grain of soil touched by the soluble fertiliser becomes coated with the insoluble product, and hence it presents to the plant roots a very much greater surface of phosphate than could be obtained by applying a fertiliser in small insoluble solid particles.

Bones.—Bones are composed of calcium phosphate, calcium carbonate, fat, nitrogenous matter and small percentages of other minerals. The majority of bone used as manure has been boiled or steamed for the purpose of freeing it from fat and nitrogenous matter, the extracted products being valuable for other purposes.

Bones were at one time simply crushed into rough lumps and applied to the land in this condition, but the rate of decomposition of pure raw bones is very much slower than that of bone that has been steamed at a high pressure. The steaming of the bone makes it soft and crumbly, and this steamed bone is fairly easily crushed to a fine state of division, and by the removal of the fat the bone is much more easily decomposed in the soil. Finely ground bone meal is particularly valuable on light soils, as the nitrogen and phosphoric acid are slowly and continuously decomposed and supply a continuous amount of food to the plant.

Lime.—This substance, besides being a plant food, exercises a big influence on the physical and biochemical properties of the soil. It is of particular use on heavy clay lands, as it causes the clay to flocculate and thereby renders these soils more amenable to cultivation. Lime also acts on the organic matter, freeing nitrogen for the use of the plants, neutralises the acids produced by the decomposition of the organic matter and is beneficial in preventing the development of certain slime fungi which are injurious to crops.

Lime is continually going into solution after performing its several functions in the soil, and owing to its general influence on soil fertility, must be regarded as an important manurial substance and should be applied occasionally to all ordinary soils. Lime deficiency may result in the failure of crops such as clover, lucerne or barley, even though the soil contains an adequate supply of all the other essential plant foods.

Relative Value of Manures.—The usual method of comparing the relative costs of different fertilisers is by means of their "price per unit." The "unit" value of any fertiliser ingredient is obtained by dividing the price of a ton by the percentage of the active manurial ingredients.

For example, nitrate of soda containing 16 per cent. nitrogen costs £17 per ton.

The unit value of the nitrogen in nitrate of soda is therefore—

$$\frac{£17}{16} = £1\ 1s.\ 3d.$$

Again, sulphate of ammonia containing 20.5 per cent. nitrogen costs £20 per ton.

The unit value of the nitrogen in sulphate of ammonia is—

$$\frac{£20}{20.5} = 19s.\ 6d.$$

Phosphate Unit Values.—In estimating the unit values of soluble and insoluble phosphates it is usually assumed that the soluble phosphate has the same value as superphosphate and the insoluble phosphate the same as in mineral phosphate.

19.5 per cent. superphosphate costs £7 2s. per ton.

$$\frac{£7\ 2s.}{19.5} = 7s.\ 3\tfrac{1}{2}d.,\text{ cost per unit of soluble phosphate.}$$

34.1 per cent. raw phosphate rock costs £6 18s. per ton.

$$\frac{£6\ 18s.}{34.1} = 4s.\ 0\tfrac{1}{2}d.,\text{ cost per unit of insoluble phosphate.}$$

It will be seen from the above that the cost per unit of soluble phosphate is 3s. 3d. more than the cost of insoluble phosphate, and the farmer will appreciate the economic ad-

vantage of utilising mineral phosphate wherever a quick-acting phosphatic fertiliser is not required.

In estimating the value of a mixed fertiliser the following procedure is adopted:—

Take, for example, a fertiliser containing—

13 per cent. phosphoric oxide (12 per cent. water soluble),

2 per cent. nitrogen (in the form of sulphate of ammonia),

and 3 per cent. potash (in the form of sulphate of potash).

The unit values of these elements in Southern Rhodesia at the date of writing are:—

phosphoric oxide (water soluble), 7s. 3½d.;
phosphoric oxide (insoluble), 4s. 0½d.;
nitrogen (as sulphate of ammonia), 19s. 6d.;

and potash (as sulphate of potash), 6s. 4d.

The value of the above mixture would be:—

2 units of nitrogen at 19s. 6d.	£1	19	0
12 units of phosphoric oxide at 7s. 3½d. ...	4	7	6
1 unit of phosphoric oxide at 4s. 0½d. ...	0	4	0½
3 units of potash at 6s. 4d.	0	19	0
Value per ton	£7	9	6½

The difference between £7 9s. 6½d. and the market price of the above fertiliser would be the amount charged by the vendors for the compounding of the mixture.

The Value of Experimental Work.—The value of the experimental work carried out at the Government Experiment Station is recognised and appreciated by most farmers in the Colony, but the necessity for carrying out experiments on individual farms by the farmer himself is not fully realised.

It is well known that soils differ in their content of the plant food elements and that those of practically the same chemical composition differ in respect to their physical properties and hence in their crop-producing power. Were it possible by a chemical analysis of the soil to determine its actual fertility and its food requirements to produce a given

yield of any particular crop, then farming would be a very simple matter.

It must be borne in mind that variations in soils and local conditions make it necessary for the farmer to study the fertility needs of his different types of soil and .to ascertain whether the requirement of his soil is for additional plant food or for better cultivation.

A careful study along experimental lines, using the principles laid down by the experiment stations, will show the needs of the soil and the most economical fertiliser treatment.

Farmers might profitably carry out experiments on their farms to determine points such as the following:—

1. The relative merits of rock phosphate and superphosphate on the maize-producing power of the soil.
2. The most economical dressing of phosphates to apply.
3. The effect of green manuring on the subsequent yields of maize.
4. The influence of liming.
5. The results of better ploughing and subsequent cultivation.

The answers to such questions as these will give much useful information, and the resulting gain from such experiments will probably amply repay the additional money and labour expended.

REFERENCE.

Rhodesia Agricultural Journal, October, 1923, page 524.

The Angora Rabbit as a Commercial Proposition in Southern Rhodesia.

By J. T. Ley, Johannesburg Farm, Norton.

[This article is published at the request of the writer, but the Department of Agriculture is not at present in a position to recommend the breeding of Angora rabbits. It is not known whether the climate of the Colony is suitable for raising these animals, nor can the Department make any statement in regard to prices of the wool. Experiments in regard to the breeding of Angora rabbits are being conducted at the School of Agriculture, Cedara, Natal, but are not sufficiently advanced to permit of any conclusions being drawn as to their possible success.—Ed.]

Many people in Rhodesia have probably never heard of this valuable little creature. The ladies may know that it is a rabbit which produces wool which, after having been through the process of spinning, is used in many articles of feminine attire. I want in this short article to bring to the notice of all readers of this Journal the financial possibilities attached to Angora rabbit farming for wool production. Many expert opinions have been given on the question of the country of origin of the Angora rabbit; I think the one we are safe to rely on is that its original home was Angora, Asia Minor. History tells us that it was a little wild creature in those days, but specimens were trapped and sold to the mariners trading to the Asiatic ports, who in turn sold them to the highest bidders on their return to the home ports. The Angora rabbit is a beautiful creature of great utility value. It is white in colour, with pink eyes and a long silky coat growing sometimes to 12 inches in length. Years ago in England and France it was kept solely for exhibition purposes, it being the beauty of the rabbit world. The French

were the first people to realise the value of its wool from a spinning point of view. For a number of years French spinners would purchase large quantities of the raw material and send it out to the villages to be hand-spun by the peasants; but with the advance of this new industry mills had to be erected to cope with the ever-increasing demand for the finished article, and France for many years supplied the world's markets with Angora rabbit wool. Our Home spinners were not content to rely upon France for their supplies, and several firms did all in their power to get English breeders to breed extensively for wool production, at the same time offering over £2 per lb. for the raw material. To-day in England there are many farms in existence running hundreds of Angoras with excellent financial results. The present market price of this wool is 35s. per lb., with the demand exceeding the supply many hundreds of times.

The wool, after having been through the spinning process, is used chiefly in many articles of clothing used by the feminine sex, in children's clothing and in the protective clothing of invalids suffering from chest complaints, rheumatism, etc., and is highly recommended by the medical profession. Many rabbits have been bred which would yield 1 lb. of wool per annum. The cost of keeping one Angora in England for one year would be roughly 7s., so that a handsome profit of 28s. is made from the wool. Then there are the extra profits from the sale of young stock. I do not want to mislead my readers to expect 1 lb. of wool per annum from every Angora on the farm; a good average throughout the whole of the stock would be between 12 and 14 ozs.

In England we castrate all surplus males; these grow to a terrific size and are in most cases the heaviest woollers.

As most of my readers are probably aware, there was an embargo on the importation into the Union of South Africa of rabbits of any description; the Government there, I think, took the lesson of the Australian fiasco to heart. On my way home to England in February last I was able to obtain an interview with General Kemp, Minister of Agriculture of the Union of South Africa. I explained the possibilities to him and asked for the relaxation of the embargo; this was refused, but I was advised to make an

application to the Government to allow me to ship them a pair of Angoras for experimental purposes at the School of Agriculture, Cedara, Natal. A permit was granted and a pair was shipped from England in May. As a result of the experiments, a Government order was issued relaxing the embargo from the 1st July.

Angora rabbit farming for wool production is now being taken up extensively throughout the Union, and I think I am not over-optimistic when I say that it will prove a boon to the people who previously had ostrich farms and also to those sheep farmers who have in recent years been so hard hit through the drought. If any reader desires further information on this subject, and will communicate with me, I shall be pleased to assist and advise him in every possible way, having had many years' experience of this branch of farming.

Some Notes on Fire-cured Tobacco.

By J. M. Moubray, Chipoli, Shamva.

The chief difference between fire-cured and flue-cured tobacco from a farmer's as opposed to a tobacco grower's point of view is that the former fits in very well as a rotation crop and is grown on the same soil as maize, whereas the latter is grown on soil that is, generally speaking, fit for little else.

To get the best results it is essential to do the ground well. Presuming that maize has been grown, this is followed by a legume, prior to the sowing of which a good dressing of raw rock phosphate has been broadcasted. Such a dressing, if applied after the maize has been reaped and before the land has been ploughed, has a distinctly beneficial effect on the green manure crop.

I have found the dolichos bean superior in almost all respects for this crop to the velvet bean. It produces a heavier crop of vegetation and is not subject to anthracnose, which is fairly common on the velvet bean, especially in a wet season, and which causes the foliage to turn black and drop off, much of the good effect of green manuring being thus lost. If kraal manure is available, a dressing of this can be applied broadcast to the ground some time before the tobacco is planted. A dressing of "bone and super" should also be given, the quantity of the latter depending on the amount of raw rock phosphate which was added before the green manure crop. If no raw rock phosphate has been applied, then 400 lbs. of bone and super per acre appears to be about what is required.

The land must be well drained; if this is so, any of the red and chocolate soils are suitable.

The tobacco is set out in the ordinary way either on ridges or the flat. Both methods have produced good results here, but as the plants and leaves are larger than the flue-cured varieties the distance apart of the plants must be from six inches to a foot more.

Planting takes place later than with flue-cured tobacco. As the leaf contains a lot of gum, what is aimed at is to have the ripening period coming on when most of the heavy rains are over and so limit the loss of gum to a minimum.

The plant is primed high. As the leaves are very large they must start from some distance up the stem, otherwise they trail on the ground. Some ten leaves are left on the plant, and topping takes place at a much earlier period than is usual with many growers of bright tobacco.

The whole object is the opposite of producing flue tobacco. With fire-cured tobacco what is wanted is as heavy and oily a leaf as possible, therefore everything must be kept in the leaf instead of being allowed to run up to the seed head and so keep the leaf light.

The plants are harvested by slitting the stem down the centre to about four or five inches from the ground and cutting it off at ground level. The plant is then straddled on the tobacco stick.

Curing takes about eighteen to twenty-one days. For the first week the leaf is allowed to colour without any fire; when it has coloured it is smoked till it turns a dark mahogany colour, this taking about a week or less. When the correct redness has been obtained the temperature is raised and the midrib dried out. Curing is now complete. The tobacco is then bulked till the curing season is over.

A great advantage of this class of tobacco is that it is graded into only four grades—three grades and rubbish.

A good class of this tobacco will realise a shilling a pound, and if the grower likes to go to the trouble of stripping the tobacco—that is, removing about two-thirds of the midrib—then the price of these strips is very much higher.*

* We understand that the majority of buyers prefer to buy the wrapper leaf unstripped.—Ed.

Writing as a farmer and not as a tobacco grower, the value of this crop is not only in the actual return it brings in, but in the splendid condition it gets the ground into for the next maize crop. The rotation then is maize, maize, legume, tobacco, and then maize again. It is quite safe to say that when this rotation has been practised for some time the actual yield of maize over the four years will be found to be greater than from four years' continuous maize where no rotation is practised.

As a general rule it will be found that the weight per acre of fire-cured leaf is about double that obtained of flue-cured leaf. As the leaf is heavier, it is probably more prone to the various kinds of spot disease than light tobacco, so that every precaution must be taken to obtain disease-free plants.

From remarks made by various buyers it appears that this type of tobacco is better if grown at the lower altitudes than on the high veld.

Some Common Ailments of Poultry.

By A. Little, Poultry Expert.

CORNS.

Corns, although they do not affect the health of the fowl, are liable, due to pain and discomfort, to cause a reduction in the output of eggs. If the male bird is the sufferer there is a marked tendency to unfertile eggs in the breeding pen.

Causes.—Prolonged pressure, irritation or bruises. Perches which are too small or too narrow, necessitating an excessively firm grip by the fowl to maintain its position. The firm grasp, night after night, affects the circulation of blood to that part of the foot that comes in closest contact with the perch. The resulting irritation and inflammation thus set up lead to multiplication and enlargement of the cells, with a consequent swelling and thickening of the skin. A hard or stony run or heavy birds flying down from their perches on to a hard floor are further causes.

Prevention.—The perches should not be less than 1½ ins. wide and 1 in. thick. It is better still if they are 3 ins. wide and 2 ins. thick, with rounded edges. They should not be more than 2 ft. from the floor and the latter should be covered with soft litter. A soft, loose run with few or no stones is of the greatest assistance in preventing this trouble.

Treatment.—Pare off the thickened epidermis carefully without causing bleeding and paint with tincture of iodine, or apply boric acid ointment (boric acid powder 1 part to vaseline 5 parts).

SWELLING OF THE FOOT.

Causes.—Usually the result of some injury such as would be caused by a thorn, nail, piece of wire, glass, etc. This should be treated at once, otherwise it may become serious, due to swelling extending up the shank and

periostitus (inflammation of the membrane covering the bone) supervening. There is usually inflammation accompanied by heat.

Treatment.—Hold the foot in water almost as hot as the hand can bear for half an hour, adding hot water from time to time. Dry the foot thoroughly and apply boric acid ointment. The bird should be kept, during treatment, in a coop with a good layer of soft grass on the floor.

BUMBLE FOOT.

This is an aggravation of the corn condition. Sometimes there is an abscess, which may or may not have broken. If the former, a suppurating sore is present. Usually the joints are much inflamed and pus may have entered them from the abscess, in which case the treatment is long and difficult and it is better to kill the bird.

Treatment.—Soak the foot in warm water (adopting treatment described for swelling of the foot) twice a day, then poultice with bran, bread or linseed meal. If the abscess is soft and fluctuating it should be opened with a sharp knife, washed well with a suitable antiseptic and boric acid ointment applied. The sore should be protected with some cotton cloth. This treatment must also be followed after poulticing.

SCALY LEGS.

This condition is very general among fowls, not only in Rhodesia, but over the whole world. Especially is this so in hot, dry climates. Much irritation is caused, resulting in loss of eggs, quite apart from the disfigurement of the bird. The number of fowls that can be seen on farms, poultry farms and at shows, etc., disfigured in this way is legion. In many cases no attempt is made to combat it, or, when present, to cure it. To the man who has any knowledge of poultry this condition is indicative that the owner of the birds is neglectful and slovenly and allows his birds to live in dirty, uncared-for surroundings.

Cause.—Technically, "scaly legs" is a form of scabies or mange produced by a mite known as "Sarcoptes mutans." Although contagious (transferable by direct contact), it does not spread rapidly. The mite penetrates between the epidermic scales on the upper surface of the foot and front of the shank, and, burrowing there, causes irritation and

thus a multiplication of the epidermic cells of the part, accompanied by exudation of serum. This exuded serum, which dries to white powdery crust, together with the excess cells, raises the scales from their normal position. If the surface under the scales is examined under a microscope or strong glass a large number of depressions will be seen. In each depression rests a female insect containing eggs. Larvæ, males and young females will also be seen moving about. The insects multiply and the crust increases in thickness until a most unsightly appearance is set up, frequently causing lameness. The condition commences either at the top of the shank and spreads downwards to the foot; or between the toes, spreading from them up the shank. Both feet and legs are usually affected simultaneously.

Treatment.—As soon as the condition is noticed, immediate and energetic measures should be adopted to get rid of it. All birds showing infection should be isolated to prevent further infection of healthy birds. The houses should be thoroughly cleaned and disinfected. The roosts and all woodwork should be well scalded with boiling water and white-washed with lime wash to which has been added some carbolic acid. The loosened scales must be softened by soaking the legs and feet in warm water and soap, then removed, without causing bleeding. After this apply a coating of soft soap, leaving this on for 24 hours. Again place the legs and feet in warm water and rub gently. After drying, apply either creolin, carbolic or sulphur ointment. The ointment should be applied daily for four or five days.

Fowls, turkeys, pheasants and cage birds are subject to this condition. Ducks and geese, however, do not suffer, possibly because the insect flourishes chiefly in a dry atmosphere, on dry ground and under dry conditions generally. The condition is not difficult to cure if treated in the early stages, but the longer it has existed, the longer and more difficult does the cure become.

Prevention.—This, briefly, consists of clean surroundings and occasional greasing in hot, dry weather of the legs and feet.

LEG WEAKNESS.

Causes.—One of the chief causes is lack of bone-forming material supplied to chickens and young growing stock. These should always have a good ration of bone meal mixed

with their food and be kept well supplied with green foods which contain phosphate of lime. Young chickens kept in brooders in which there is unequal heat or too much bottom heat are apt to develop this ailment. Chickens that are allowed to run on wood or hard floors uncovered by soft litter are liable to develop leg weakness. Adult birds are subject to the complaint if kept in badly ventilated or damp houses, as also are heavy young cockerels.

Symptoms.—The onset of the complaint may be gradual or sudden. There is a marked unsteadiness in the gait or even pronounced lameness, which becomes worse. Eventually the bird sits down, resting on its shanks and hocks, even when eating. With further progress of the complaint the bird is often unable to assume a normal standing position.

Treatment.—Bone meal in the food, together with Parish's chemical food (one teaspoonful to a pint of water), is recommended. The food should also include bran, rice, plenty of green food and milk, the latter being either separated or unseparated. Condiments and m.at should not be given and all stimulating food avoided.

DEPRAVED APPETITE.

Causes.—This ailment is usually the result of disease of some portion of the digestive organs. It may be due also to habit. Catarrh of the crop, partial obstruction of the gizzard (due to lack of grit) or worms are also causes.

Birds suffering in this way will be seen to eat nails, cinders, pieces of wire, cloth, hair, feathers, dry leaves, etc., and often develop feather plucking.

Treatment.—Add to the drinking water some bicarbonate of soda (10 grains to a pint), and to the food a little salt. Force the birds to take plenty of scratching exercise by burying all grain in deep litter. Give easily digested and cooling foods, together with an abundance of succulent green food, especially onions and onion tops.

It is meticulous attention to detail, with a sensible application of the advice given in the proverb that "A stitch in time saves nine," that chiefly make for success in poultry keeping. The necessity for attention of the poultry keeper to the finer points cannot be too highly stressed, for it is far too frequently neglected.

Tractor Ploughing.

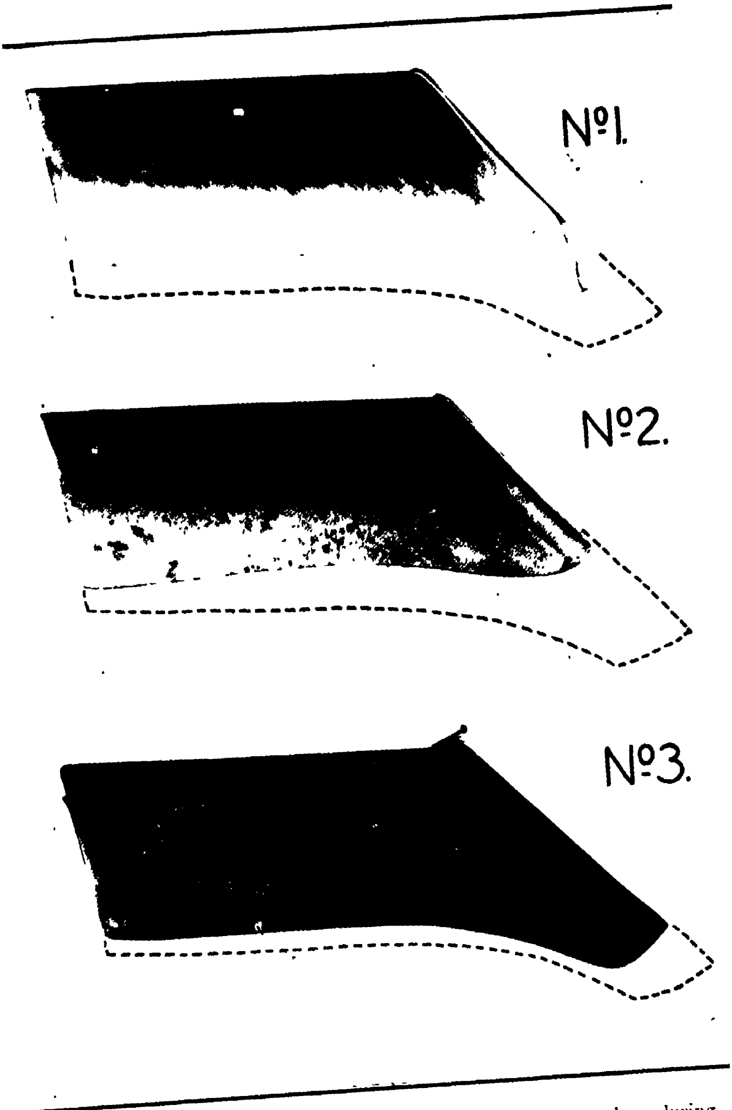
In the October issue of this Journal we published an article on tractor ploughing by Mr. A. W. V. Crawley, in which he particularly referred to the relative suitability of different types of plough shares for various soils. Mr. Crawley has since forwarded us three shares with a record of their performances which bears out his previous statements to a very marked degree.

A photograph of the shares is reproduced herewith, in which dotted lines indicate the original shape of the shares, so that the amount of wear that has taken place may be seen at a glance; but, when making comparison, it must be remembered that there is a big difference in the acreage ploughed by each share, as will be seen from the following tables:—

TESTS ON THREE TYPES OF "OLIVER" PLOUGH SHARES.

No.	Type.	Cost on farm.	Acreage ploughed.	Type of soil.	Cost per acre.	Remarks.
1	Soft centre steel	25/-	22	Sandy loam	1s. 1-2/3d.	Would also cost more in paraffin owing to the poor cutting edge and increased draught.
2	Crucible steel	16/-	30	Sandy loam	6-2/5d.	Has worn uniformly and kept sharp. Would not pay to use any longer.
3	Chilled steel casting	10/-	200	180 acres sandy loam, 20 acres very gritty soil	0-3/5d.	Used on two-furrow plough with numbers 1 and 2 until they were worn out. It has worn out six other shares and is still good for another 50 or 100 acres. It has been sharpened on grindstone.

The following extract from Mr. Crawley's letter accompanying the shares will also doubtless be of interest to farmers in general, apart from those particularly concerned with tractor work:—



This illustration clearly shows the wear which has taken place during the experiments.

"All three shares have been used on exactly the same type of soil and on the same plough. The chilled share has in addition ploughed some very difficult gritty soil. The first two shares have always been protected when not in use, but the chilled share has not. By scraping the chilled share with a knife blade it is noticeable that the rust does not pit or penetrate into the metal. One end has been cleaned to show this. A few yards' travel in the ground will completely clean off the rust and polish the share. The soft centre share takes a good polish, but grit severely scratches it, and these scratches would, if used in some clay soils, prevent proper scouring, and the soil would stick to the share. With the point gone and the groove on cutting edge, draft would be harder and would, I think, cost over 6d. per acre for extra amount of fuel required. At first I considered that the soft centre shares were badly made and tempered, but the makers assured me it was not so. I have noticed that soft centre shares of three different makes are all affected the same way on certain soils, but on other soils give every satisfaction.

"It is noticeable that crucible steel shares—which are softer than soft centre or chilled—wear evenly, do not scratch and keep sharp.

"If we consider the possibility of one using the wrong share, wrong type of plough, the plough badly hitched, the carburettor of tractor not properly adjusted and the ground not in proper ploughable condition, it is easy to see why so many complaints are made of the high cost of tractor ploughing."

We should like to take this opportunity of expressing our thanks to Mr. Crawley for having placed this valuable information at the disposal of our readers.

Hay-making.

A correspondent writes to the Chief Agriculturist as follows:—

> "Why do you not write and advise farmers, and especially new settlers, to cut their grass at the end of December or early January, so that they can make good quality hay from the second cutting, which is generally obtainable in the latter part of April after the rains are over? You gave me this advice some years ago and I have done it every year since. Everybody is struck with the colour and quality of my hay."

The best hay is obtained if the grass is cut when the majority of the species comprising the herbage are in flower; as later stages of development in the grasses are reached, the quality of the hay depreciates. Generally speaking, very good hay is secured by cutting during dry spells which may occur during March or even earlier, for at this time most of the grasses are in flower. The method suggested to the correspondent is also, however, a sound one. By mowing the grass in November, December or early January an aftermath or second growth is obtained which is flowering about the time the rains are ceasing, and thus hay-making is facilitated while the grass is in its best condition for conversion into hay.

H. G. M.

Correspondence.

[*No responsibility is accepted by this Journal for the views expressed by correspondents.*]

Oatlands,
P.B., Salisbury,
10th November, 1927.

The Editor,

The Rhodesia Agricultural Journal.

Sir,

Labour-Saving Appliances.

In the last issue of the Journal you ask for particulars of labour-saving machinery. Some remarks on milking machines may be of interest.

As most people are probably aware, the principle of all the machines in common use is the same.

The teat cup has a metal cover with a rubber tube inside which fits on the cow's teat. One tube connects with a vacuum pipe direct to the cow's teat, while another tube connects with the air-tight space between the outer case and the rubber lining to another pipe, which alternately lets in air and draws it out, this action being obtained by a pulsator placed in different parts of the machine in different makes.

The commonest method is to use an oil engine to drive a vacuum pump, and the pulsator is driven by a light cord or belt from a pulley on the vacuum pump.

Equally reliable results can be obtained by creating a vacuum in the main pipe by means of a jet of steam from a boiler, and in that case an automatic pulsator is placed on the bucket lid. The great advantage of a machine driven by an oil engine is that it starts at once at any time. The disadvantage in this country is the high cost of fuel, which would put it out of the running as far as cost is concerned compared with native labour. The only disadvantage of

using steam is the time taken to get up steam before milkings. On the other hand, the cost of fuel is very little on most farms.

Another great advantage of using a boiler is having an abundant supply of hot water for washing up immediately the milking is finished.

I am, etc.,

J. MILLER.

The Editor,

The Rhodesia Agricultural Journal.

Sir,

Labour-Saving Devices.

In your November issue there appears an article "Labour-Saving Machinery." In his first paragraph your correspondent refers to an implement for ridging land for tobacco and fertilising it at the same time. Where can such an implement be had? I have not seen it advertised. It seems it would be quite simple to fix three ridge ploughs together, side by side, and to have fertilising attachments in front of the shares. At the back of the machine there could be a light roller, circumference 3 ft., to flatten the top of the ridges; and on this roller there would be one marker running along the length of it and standing out about 3 or 4 ins., so that each time the roller revolved this marker would indent the top of the ridges at intervals of 3 ft. This would facilitate spacing the seedlings when planting.

The watering of seed beds could be done more easily and evenly by rigging up an old utility cart into a water cart like the ones used for laying the dust on the roads. It would have to carry a tank holding about 18 gallons of water for a bed 25 yds. long, and a tap from this would regulate the flow of water into a perforated trough about 1 ft. from the ground and extending from side to side of the cart and the width of the bed. The wheels of a utility cart are 5 ft. 6 ins. apart, so the wheels would span the seed bed easily, and two boys, one on either side, could push the cart along.

When picking tobacco I can get sufficient for a standard sized barn on to one wagon and a Ford chassis with a platform on it. This latter has to have a special disselboom

attachment and is useful for any light loads. On the wagon I have extensions of about 18 ins. on either side, so that the tobacco need not be stacked so high. There will be ladders on either side of the wagon so as to eliminate needless handling at the wagon. Each carrier will put down his load of tobacco on the wagon, and it will not have to be handled again till it reaches the stringing shed.

When tying tobacco I intend to cut out carrying the tobacco from the wagon to a stringing shed by making it possible for the boys to string direct from the wagon. To do this I shall have a long narrow pit dug about 3 ft. deep and about 1 ft. wider than the wagon. Its entrance and exit will be sloped and the boys will man-handle the wagon into it. On either side of this pit the boys will string the tobacco. The boys who make the leaves up into "hands" will take the leaves direct from the wagon. This method will eliminate a needless handling and will make the work easier, because the leaves will not get disordered through carrying them to a stringing shed. The depth of the pit will be so arranged that the boys who make the leaves up into "hands" will stand to their work and not sit.

If I am rushed when curing I shall bale the tobacco without unstringing it, and then at a later date open the bales and unstring it. It will mean having extra string, but that is not expensive. An advantage will be that any tobacco which is baled in too high a condition will be discovered before much damage is done.

Ordinarily, when emptying and refilling a barn in a day, at least three or four hours are spent unstringing cured tobacco. I shall be able to do it in very much less time by baling, string and all; and I can see no disadvantage.

I am, etc.,

"GROWER."

15th November, 1927.

Movements of New Settlers.

The following new settlers arrived in the Colony during the month of October, 1927:—

R. V. Norwood.—Arrived from Great Britain on 5th October and proceeded to Brig.-General Higginson, Umvukwes, for a period of training.

E. Goodwin.—Arrived from Great Britain on 5th October on tour of inspection.

J. Goodman.—Arrived from the Union on 5th October to manage Mede Farm, Wellesley.

T. Wilson.—Arrived from the Union on 5th October with the object of taking farm employment.

Sir Francis Duck.—Arrived from the Union and is staying in Salisbury.

W. W. Laird.—Arrived from Great Britain and proceeded to Mr. G. Peake, Dalston, Banket, for a period of training.

S. T. Jones.—Arrived from Great Britain on 7th October and proceeded to Captain J. C. Jesser Coope, Nyamandhlovu, for a period of training.

N. G. Barrett.—Arrived from the Union on 7th October and has acquired land at Rusape.

L. Powys Lane.—Arrived from Great Britain on 7th October and proceeded to Commander Knight at Banket.

F. P. Arsmond.—Arrived from the Union and proceeded to Sir Thomas Cullinan, Arcadia, Bindura.

M. Seymour.—Arrived from Great Britain on 14th October and proceeded to Mr. H. J. du Preez, Umvukwes.

B. L. Ockwell.—Arrived from Great Britain on 14th October and proceeded to Mr. M. E. Bee, Burton Vale, Bindura.

T. O. B. Hoare.—Arrived from Great Britain on 16th October and proceeded to Mr. R. L. Hartley, Wares, Fort Victoria, for a period of training.

E. Meyer.—Arrived from the Union on 17th October and proceeded to Mr. J. D. P. Collins, Marandellas.

J. R. Thomas.—Arrived from the Union on 17th October and proceeded to Colonel Moore, Umvukwes.

A. E. Cox.—Arrived from Great Britain on 19th October on tour of inspection.

R. D. Spitteler.—Arrived from the Union on 20th October and joined Mr. R. L. D. Herbert, Gabaza Reserve.

J. H. Pollard.—Arrived from Great Britain on 24th October and proceeded to Major Hastings, Maringowie, Headlands, for a period of training.

H. Pollard.—Arrived from Great Britain on 24th October and took employment in Salisbury.

A. White.—Arrived from Great Britain on 24th October and proceeded to Mr. R. J. Forrest, Frogmore, Glendale, for a period of training.

S. de Blank.—Arrived from Great Britain on 24th October and proceeded to Mr. R. J. Forrest, Frogmore, Glendale, for a period of training.

R. Stewart.—Arrived from the Union on 24th October on tour of inspection.

C. P. M. Hansen.—Arrived from the Union on 26th October on tour of inspection.

B. F. Barratt.—Arrived from the Union on 26th October on tour of inspection.

J. Lamb.—Arrived from the Union on 26th October on tour of inspection.

J. Westray.—Arrived from the Union on 26th October on tour of inspection.

N. S. Durant.—Arrived from Great Britain on 28th October and proceeded to Messrs. Houblon and Robertson, Sinoia, for a period of training.

E. P. Oftebro.—Arrived from the Union on 28th October with the object of obtaining farm employment.

H. Stobart.—Arrived from Great Britain on 28th October and proceeded to Marandellas with friends.

S. H. H. Heaver.—Arrived from the Union on tour of inspection.

E. R. C. Inge.—Arrived from Great Britain on 28th October and proceeded to Mr. O. C. Rawson, Darwendale, for a period of training.

S. G. Trow.—Arrived from the Union on 29th October on tour of inspection.

F. H. Upcott.—Arrived from the Union on 29th October and proceeded to Mr. J. G. Duncan, Warwick, Marandellas, for a period of training.

R. A. G. Griffiths.—Arrived from Great Britain on 21st October and proceeded to Mr. R. V. Gorle, Bromley, for a period of training.

Southern Rhodesia Veterinary Report.

September, 1927.

AFRICAN COAST FEVER.

CHARTER DISTRICT.—A fresh outbreak occurred on the farm Pennyfather, adjoining the infected farm Wildebeestlaagte. A calf died, apparently from poverty, but the examination of smears showed that African Coast Fever was the cause of death. The source of infection in this case is undoubtedly Wildebeestlaagte, disseminated probably before the discovery of the disease there in February last.

The above was the only case of Coast Fever recorded in the Colony during the month.

ANTHRAX.

An outbreak occurred in the Mazoe district. One ox died. All cattle in contact were vaccinated.

TUBERCULOSIS.

The quarantine station at Bulawayo was completed towards the end of August, and it was decided to apply the tuberculin test to all cattle on importation. During the month 77 bulls, 77 cows and one heifer were tested. Nine cows reacted and were slaughtered; post-mortem examination revealed lesions of tuberculosis in each case. Prior to the establishment of this station, certificates of having passed the tuberculin test were required in respect of dairy cattle imported, and all the cows referred to were accompanied by such certificates. The results of the first month's operations more than justify the testing of all animals on arrival. All cattle imported during the current year are being traced and the test applied; so far two cows in the Mazoe district reacted. Tuberculosis was 'revealed on post-mortem examination in both cases.

HEARTWATER IN CATTLE.

A mortality of about 250 head occurred in the Gwanda district amongst cattle moved to new veld because of drought conditions. The rate of mortality decreased with the institution of five-day dipping.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 67; cows, 80; horses, 27; mules, 59; donkeys, 65; sheep, 1,369; goats, 401; pigs, 40.

EXPORTATIONS.

To Union of South Africa:—For consumption in Union, 741; for export overseas, 8. To Belgian Congo:—For slaughter purposes, 1,422; for breeding purposes, 29. To Northern Rhodesia:—Bulls, 19; cows, 42. To Portuguese East Africa:—For slaughter purposes, 110; trek oxen, 24.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Review.

"The Rhodesian Annual, 1927." (Designed, printed and published by the Rhodesian Printing and Publishing Co., Ltd., Bulawayo. Price, 3s.)

This annual, the second production under the present ægis, is attractively printed on art paper, the illustrations particularly being of a high standard.

Under the heading of "Rhodesia," rather pertinent comments are made by a South African (who has never visited this country) upon the South African conception of the Rhodesian. This will no doubt arouse some controversy, but it may be well to consider whether there is not a substratum of truth in the criticisms levelled at ourselves. The submission is replied to, rather inadequately, by a "Rhodesian."

Education, always an important factor in the development of a new country, is considered, from a progress point of view, by Mr. L. M. Foggin, M.A. (Oxon.), O.B.E., Director of Education.

The subject of mining is given perhaps a little undue prominence at the expense of the agricultural aspect.

Nevertheless, "The Rhodesian Annual," quite apart from any small strictures passed upon its contents, is well worthy of perusal, and, as mentioned, the illustrations and art supplement are well worthy of commendation.

E. H. B.

Southern Rhodesia Weather Bureau.

OCTOBER, 1927.

Pressure.—Pressure during the month was about normal, varying from 0.059 in. below normal at Livingstone to 0.039 in. above normal at Umtali. The country was visited by five high pressure systems and six low pressure systems. Of the highs, two minor systems appeared off the west coast on the 3rd and 6th and were near Beira on the 6th and 9th respectively. A high passed along the south coast on the 11th, 12th and 13th. A high appeared off the west coast on the 13th and was off the south and east coasts until the 20th, when it appeared at Lourenco Marques and moved inland; it remained between Lourenco Marques and Bulawayo until the 25th, and was associated with the rains during this period. A further high appeared on the south coast on the 24th, was at Durban on the 28th and then passed inland, being slightly to the south of Rhodesia on the 31st; this high was also associated with rain. The movements of lows during the month were unusual. Southerly lows were in evidence off the south and south-east coasts on the 1st, 2nd and 3rd, 5th and 6th, 9th, 10th and 11th, 13th and 14th; of these, those of the 5th and 6th, 9th, 10th and 11th and 13th and 14th were associated with northerly lows. The first period of rain from the 14th to the 19th was associated with the northerly and southerly lows of the 14th and the following high. The rain on the 22nd and 23rd was associated with the high of those days. The rain from the 28th to the 31st was associated with the rapid movement of a trough of northerly low; on the 28th this extended from Livingstone to Capetown; on the 29th the southerly portion had swung to Durban and a complementary depression extended over Mashonaland from the north; on the 30th the trough was not in evidence, but a low was central in south

Mashonaland; on the 31st this low had moved north. Severe rain and hail storms were associated with this movement.

Temperature.—The temperature during the month was generally below normal, varying from 3.5° F. below normal at Tuli to 1.1° F. above normal at Melsetter. The mean day temperatures were below normal, varying from 4.9° F. below normal at Sipolilo to 1.0° F. above normal at Matopos. The mean night temperatures were above normal, varying from 2.7° F. above normal at Essexvale to 3.5° F. below normal at Tuli.

Relative humidity was above normal, varying from 12% above normal at Salisbury to 16% below normal at Enkeldoorn.

Rainfall.—The total rainfall over the country for October amounts to 1.52 ins., as compared with a normal of 1.00 in. It was distributed as follows:—

	October, 1927	Normal, October.
Zone A (western Matabeleland) ...	1.32	0.80
Zone B (south-eastern Matabeleland)	1.62	0.90
Zone C (western Mashonaland) ...	1.20	1.08
Zone D (north-eastern Mashonaland)	1.48	0.94
Zone E (south-eastern Mashonaland)	1.92	1.20
Zone F (eastern border)	2.37	1.91

It is thus seen that the rainfall was above normal in all zones.

In Zone A the district with the greatest rainfall was Insiza with 2.56 ins., and the district with the least rainfall was Wankie with 1.23 ins.

In Zone B the district with the greatest rainfall was Gwanda with 2.97 ins., and the district with the least rainfall was Belingwe with 1.01 ins.

In Zone C the district with the greatest rainfall was Salisbury with 2.34 ins., and the district with the least rainfall was Sebungwe with 0.37 in.

In Zone D the district with the greatest rainfall was Salisbury with 2.50 ins., and the district with the least rainfall was Darwin with 0.06 in.

In Zone E the district with the greatest rainfall was Umtali with 3.60 ins., and the district with the least rainfall was Victoria with 0.85 in.

In Zone F, 2.76 ins. were registered in Melsetter.

Rain Periods.—Rain fell in three periods during the month. The first period started on the 14th with rain in southern Matabeleland and Mashonaland. On the 15th the whole of Matabeleland was affected, and on the 16th rain extended from Mazunga to Salisbury. On the 17th rain was fairly general; on the 18th it fell in Mashonaland only. Rain was experienced in the extreme north and east on the 19th. The second period was on the 22nd and 23rd. The high veld only was affected and the rain fell in light showers. The third period commenced on the 28th with showers in south-eastern Matabeleland. On the 29th the greater part of Mashonaland received rain. On the 30th rain fell in Zones D and E, being particularly heavy in north-eastern Mashonaland. On the 31st the rain was confined to north-eastern Mashonaland and was very heavy in the Mazoe Valley, causing considerable floods.

Zone B.—

Plumtree.—

The rains in the last half of the month were very welcome, but were quite local in distribution. After the first rain the clouds hung about for over a week, and although no further rain fell from that mass of clouds, it allowed previous rain to sink in and kept evaporation low.

The aspect of the country has as a result quickly changed, the young grass appearing everywhere. All the trees too are in leaf. Much more rain is, however, necessary before ploughing will be universal.

Zone C.—

Gatooma.—

This October has been noticeably cooler than is usual for this period of the year. Only light showers of rain have been recorded, preceded on each occasion by violent dust storms. Only 0.58 in. of rain has been registered for the month, this being below normal, although heavy rains in the immediate vicinity of the town have been reported, and the

surrounding country is consequently not suffering from want of rain.

Sinoia.—

The month generally was fine. Showers of rain fell on four days in the latter half. About the 16th, 17th and 18th, heavy thunder was heard and lightning was observed to the south-east. Total rainfall, 1.01 ins. The rain, seemingly heavier to the south-east, gradually decreased in volume as it approached the north-west, until about 30 miles north-west of Sinoia, where none was recorded. Double the quantity fell along the hills near the station. Winds mainly east-north-east, varying with rain. Grass apparently not affected by the showers.

Salisbury.—

The pressure during the month was somewhat below the normal. A slight hail was recorded on the afternoon of the 30th. The first half of the month was typified by dusty mornings, which became still and hot towards noon, this latter condition dominating the afternoons. A peculiar feature of the rains which fell was that they were accompanied by strong southerly winds. The advent of these rains brought cloudy weather, affording a sharp contrast with the clear skies of the first half of the month. A solar halo was observed at 9 a.m. to 10 a.m. on the 21st.

Zone D.—

Mazoe Dam.—

Good rains fell on 17th, 18th and 19th, a shower on the 23rd, and five days later, on the 29th, 1.20 ins., and on the 31st, 1.97 ins. at observing station. On the latter date at the evaporimeter, moored within one mile of station, no less than 2.60 ins. were registered, which makes the rainfall to date the heaviest for seven years by nearly 2 ins. Ploughing is well advanced everywhere, also tobacco seed beds. Thousands of bags of mealies are still exposed to the rains in various places. There is prospect of early planting.

Shamva.—

The month was decidedly cooler than October, 1926, during the day, but the nights were warmer in comparison. Steady rain on the last three days of the month; heavy local storm on 31st, flooding Shamvinyama River.

Zone E.—

Umtali.—

1st to 8th October: Boisterous winds; warm and hazy; heavy clouds and moist atmosphere in evenings. 9th to 12th: Warm, with moderate breezes and close nights. 13th to 16th: Boisterous winds; very close. 17th: Thunder storm at midnight. 18th to 21st: Rains and cooler weather. 22nd to 28th: Bright weather, with fresh breezes. 29th to 31st: Good rains.

Riverdene North, Victoria.—

The first half of the month was sultry, with fairly high temperatures and continuous dust storms; then followed indications of rain, with thunder around and some lightning, mostly northerly. Only a drizzle fell here, but there must have been good rains to the north, as on the 19th the river rose a foot. On the 29th, following a heavy squall from the south-west, 0.12 in. fell, and on the 30th a strong south-easter suddenly veered north-westerly with a thunder storm and nice shower, but the wind immediately returned again to its original quarter. The small quantity that has fallen has greatly freshened the district, which was very dry, with not a vestige of feeding for stock. Herds were wandering all over the country looking for pasture, and were a nuisance to everyone. Farms around in many cases seem greatly over-stocked.

The temperature has not been very high this month, but the winds have generally been strong during the day, and mostly from the south-easterly quarter. The temperature and general appearance of sky do not give one the impression that the wet season has yet arrived. Veld fires were in evidence early in the month.

RAINFALL.

Station.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	nil	1.47	1.47	.96
Inyati ...	,,	3.35	3.35	1.02
Judsonia ...	,,	2.55	2.55	n.s.
Martha Farm ...	,,	2.24	2.24	.88
Shangani Estate ...	,,	2.68	2.74	.94
Bulalima-Mangwe—				
Centenary ...	nil	2.88	2.93	n.s.
Kalaka ...	,,	2.35	2.35	.94
Riverbank ...	,,	1.63	1.63	.96
Solusi Mission ...	.10	2 91	3 01	1.00
Bulawayo—				
Fairview Farm ...	nil	1 25	1.25	.91
Keendale ...	,,	2.52	2.52	.90
Lower Rangemore ...	.03	1.92	1.95	.97
Observatory ...	nil	2.07	2.10	1.00
St. Peter's Diocesan School .	,,	1.78	1.85	n.s.
Waterworks ..	,,	1 97	1 97	.96
Gwelo—				
Brockenhurst ..	nil	1.58	1.58	n.s.
Dawn ..	,,	3.08	3 08	1.03
Frogmore ..	,,	2.29	2.41	n.s.
Gwelo Gaol ...	,,	2.19	2.26	1.09
Riversdale Estate ...	,,	2 85	2 85	1.20
Somerset Estate ...	,,	1.45	1.49	1.04
Insiza—				
Orangedale ...	nil	nil	nil	1.16
Shangani .	,,	2 79	2.79	.96
Thornville ...	,,	2.33	2.48	1.03
Nyamandhlovu—				
Gwaai Reserve .	nil	2.30	2.30	n.s.
Gwaai Siding ...	,,	2 54	2 55	n.s.
Impondeni ...	,,	1.30	1.30	n.s.
Naseby ...	,,	2 44	2.44	.91
Nyamandhlovu Railway ...	nil	nil	nil	.94
Paddy's Valley ...	,,	1.42	1.42	1.08
Sebungwe—				
Gokwe ...	nil	nil	nil	1.17
Umzingwane—				
Springs ...	nil	1.62	1.83	1.00
Wankie—				
Matetsi Railway ...	nil	nil	nil	1.23
Ngamo Railway ...	,,	3 03	3.07	1.19
Sukumi ...	,,	.65	.65	n.s.
Victoria Falls ...	nil	nil	nil	n.s.
Victoria Falls Railway ...	,,	.87	.87	1.15
Wankie Hospital ...	,,	.35	.35	.95
Zone B.:				
Belingwe—				
Bickwell ...	nil	1.01	1.37	1.31

RAINFALL—*(Continued).*

STATION.		1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE B.—(Continued)					
Bulalima-Mangwe—					
Bruwapeg	...	nil	.65	.70	1.07
Edwinton	...	.03	1.18	1.26	1.23
Empandeni	...	.01	1.13	1.24	1.19
Fallowfield	...	nil	.44	.58	n.s.
Garth	...	.39	.94	1.40	1.40
Maholi		nil	nil	nil	1.28
Retreat	...	.01	1.54	1.56	1.23
Sandown	...	nil	1.36	1.36	1 30
Semokwe Reserve	...	.05	.94	1.09	n.s.
Tjankwa	...	nil	nil	nil	1.34
Tjompanie	...	02	4 03	4.05	1.29
Chibi—					
Nuanetsi Homestead	...	nil	nil	nil	.88
Gwanda—					
Antelope Mine	...	nil	nil	nil	1.11
Gwanda Gaol	...	.76	1 02	1.89	1.16
Limpopo	...	nil	4.20	4.20	.67
Mazunga	...	.37	2.67	3.13	.91
Mtetengwe	...	nil	4.00	4.00	n.s.
Tuli	...	,,	nil	nil	.79
Insiza—					
Albany	...	nil	1.93	2 16	1.24
Filabusi	...	,,	1.23	1.23	1.19
Fort Rixon	...	,,	1.91	1.91	1.24
Inyezi	...	,,	1.82	2.14	1.21
Lancaster	...	...	...	...	n.s.
Scaleby	...	nil	1 10	1.34	n.s.
Wanezi Mission	...	...	...	...	n.s.
Matobo—					
Bon Accord	...	.15	1.42	1.62	n.s.
Fort Usher	...	nil	1.58	1 62	n s.
Holly's Hope	...	.40	1.37	1.95	1 20
Longsdale	...	nil	1.71	1.71	n.s.
Matopo Mission	...	,,	1.91	2.26	1 47
Matopo School	...	nil	1.62	1.62	n.s.
Mtshabezi Mission	...	1 03	.77	1.89	1.23
Rhodes Matopo Park	...	nil	1.72	1.79	1.32
Umzingwane—					
Balla Balla	...	nil	1.41	1.63	1.33
Essexvale	...	.03	2.05	2.19	1.30
Heany Junction	...	nil	1.42	1.42	1.45
Hope Fountain	...	,,	nil	nil	1.42
ZONE C.:					
Charter—					
Bushy Park	...	nil	1.12	1.12	1.34
Enkeldoorn	...	,,	1.76	2.09	1.38
Marshbrook	...	,,	.75	.75	1.33
The Range	...	,,	2.19	2.19	1.43
Vrede	...	,,	1.54	1.54	1.33

RAINFALL—(*Continued*).

Station.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Chilimanzi—				
Beacon Hill ...	nil	.89	.98	n.s.
Central Estates ...	,,	1.17	1.17	1.40
Fourie's Post ...	,,	.80	.80	n.s.
Orton's Drift ...	.14	1.82	2.11	1.40
Sebakwe Post ...	nil	1.22	1.22	n.s.
Umvuma Railway ...	.57	1.53	2.10	1.29
Gwelo—				
Cross Roads ...	nil	2.21	2.27	1.23
Delane Estate ...	,,	2 21	2.24	n.s.
East Clare Ranch ...	.02	.85	.87	n.s.
Globe and Phœnix Mine ...	nil	1.94	1.94	1.28
Indiva ...	...	...	...	n.s.
Iron Mine Hill ...	.20	.90	1.10	n.s
Lannes Farm ...	nil	1 56	1.56	n.s.
Lyndene ...	,,	1.90	2.02	n.s.
Rhodesdale Ranch ...	,,	1.05	1 05	1.26
Woodendhove ...	,,	1.84	1.84	1.34
Hartley—				
Ardgowan ...	nil	2.20	2 20	1.44
Balwearie ...	...	...	...	n.s.
Battlefields ...	nil	2.55	2 55	1.31
Beatrice ...	,,	1.30	1.30	1 49
Carnock ..	,,	1.17	1.22	1.44
Cromdale ...	,,	.98	1.17	1.43
Currandooley ...	,,	1.09	1.59	n.s.
Eiffel Blue Mine ...	,,	1.29	1.29	n.s.
Elvington ...	,,	.90	.97	1.42
Gatooma ...	,,	.58	.58	1.46
Gatooma Experiment Station	,,	.56	.56	n.s.
Gowerlands ...	,,	1.49	1.52	1.37
Handley Cross ...	,,	1.48	1.55	n.s.
Hartley Gaol ...	,,	.74	.76	1.42
Hopewell ...	,,	1.62	1.62	1 46
Jenkinstown ...	,,	1.06	1.32	1.43
Maida Vale ...	,,	1.08	1.20	n.s.
Meadowlands ...	,,	1.45	1.45	n.s.
Nyadgori ...	,,	1.04	1.10	1.43
Pulham ...	,,	1.75	1.77	1.51
Ranwick ...	,,	1.23	1.23	1.41
Sunny Bank ...	,,	.91	1.00	n.s.
Thorndyke ...	,,	1.13	1 26	n.s.
Lomagundi—				
Argyle ...	nil	nil	nil	1.34
Between Rivers ...	,,	2.30	2.48	n.s.
Citrus Estate ...	,,	1.44	1.54	1.30
Darwendale ...	,,	1.41	1.41	1.35
Debera ...	...	...	...	n.s.
Devonia ...	nil	1.29	1.48	1.32
Dingley Dell ...	,,	1.18	1.18	n.s.
Gambuli ...	,,	.54	.68	1.46

RAINFALL—(*Continued*).

Station.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi (continued)—				
Impingi ...	nil	nil	nil	1.20
Kapiri ...	,,	1.01	1.01	n.s.
Kashao ...	,,	1.71	2.07	n.s.
Kenidia ...	,,	1.52	1.70	n.s.
Lone Cow Estate ...	nil	nil	nil	1.38
Mafoota ...	,,	.40	.61	1.24
Maningwa ...	,,	2.13	2.20	1.34
Mica Field ...	,,	.10	.62	n.s.
Montrose ...	,,	.93	.93	1.25
Mpandegutu ...	,,	2.66	2.71	1 37
Msina ...	,,	1.30	1.48	n.s.
Mukwe River Ranch ...	nil	nil	nil	1.26
North Banket ...	...	...	...	n.s.
Nyapi ...	nil	1.49	1.49	n.s.
Nyarora ...	,,	.82	.94	1.20
Nyati ...	,,	nil	nil	1.11
Palm Tree Farm ...	,,	2.69	2 84	1.34
Puri ...	...	...	.	n.s.
Raffingora .	nil	1.07	1.07	n.s.
Richmond ...	,,	.58	.83	.97
Robbsdale ...	,,	.60	.87	n.s.
Romsey ...	,,	.96	1.11	1.23
Silater Estate	...	...	...	n.s.
Sinoia ...	nil	1.01	1.31	1.35
Sinoia's Drift ...	...	...	...	n.s.
Sipolilo ...	nil	.31	1 00	1.34
Tsanunu ..	...	..	...	n.s.
Umboe ...	nil	1.36	1.36	n.s.
Umvukwe Ranch ...	,,	1.57	2.09	1 37
Woodleigh ...	,,	2.65	2.73	n.s.
Yeanling ...	nil	nil	nil	1.28
Marandellas—				
Rocky Spruit ...	nil	1 85	1.90	n.s.
Salisbury—				
Avondale (Broadlands) ...	nil	2.32	2.43	1.40
Ballineety ...	,,	2.13	2.38	n.s.
Botanical Experiment Station	,,	nil	nil	1.37
Bromley ...	,,	1.99	2.43	1.44
Cleveland Dam ...	,,	3.72	3.83	1.37
Forest Nursery ...	,,	2.25	2 50	1.42
Gwebi ...	,,	1.94	1.94	1.41
Lochinvar ...	,,	2.38	2.38	1.29
Manor Farm ...	,,	1.84	1.90	1.56
Salisbury Agricultural Dept.	,,	2.26	2.31	1.40
Sebastopol ...	,,	2.13	2.27	1.45
Stapleford ...	,,	2.71	3.03	1.49
Tobacco Experiment Station	,,	2.46	2.52	n.s.
Western Commonage ...	,,	3.30	3.30	1.46
Sebungwe—				
Sikombela ...	nil	.37	.44	1.42
Wolverley ...	...	...	...	n.s.

RAINFALL—(*Continued*).

Station.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
Zone D.:				
Darwin—				
Cullinan's Ranch ...	...	...	..	n.s.
Fountains ...	...	...	...	n.s.
Mount Darwin ...	nil	nil	.08	1.21
Rusambo ...	,,	.17	.23	n.s.
Inyanga—				
Inyanga ...	nil	1.24	1.24	1.48
Juliasdale ...	.08	1.00	2.79	n.s.
Rhodes Estate ...	nil	1.94	3.33	1.54
Makoni—				
Ardlamont ...	nil	1.73	1.88	n.s.
Eagle's Nest ...	,,	1.42	2.55	1.32
Mayo Ranch ...	...	...	.	n.s.
Nyogeni ...	...	...	. .	n.s.
Marandellas—				
Fault Farm ...	nil	1.50	2.45	n.s.
Mazoe—				
Argyle Park ...	nil	.35	42	n.s.
Atherstone ...	,,	1.19	1.24	n.s.
Bellevue ...	,,	2.02	2.29	n.s.
Benridge ...	,,	.56	.56	1.35
Bindura ...	,,	1.26	1.26	1.32
Ceres ...	,,	1.04	1.55	1.42
Chipoli ...	,,	nil	nil	1.27
Citrus Estate ...	,,	2.04	2.65	1.28
Craigengower ...	,,	.96	1.50	1.24
Dandejena ...	,,	.69	.84	n.s.
Donje ...	,,	.29	.92	n.s.
Frogmore ...	,,	.31	.76	n.s.
Glen Divis ...	,,	1.91	2.04	n.s.
Glen Grey ...	...	...	. .	n.s.
Great B ...	nil	1.41	1.41	1.19
Hinton ...	...	...	...	n.s.
Horta ...	nil	1.05	1.05	1.28
Kilmer ...	,,	nil	nil	1.27
Kingston ...	,,	1 59	1.59	1.42
Mazoe (N.C.) ...	,,	3.50	3.50	1.29
Mazoe Dam ...	,,	4.58	4.70	1.43
Maienzi ...	,,	1.14	1.14	n.s.
Marston ...	,,	nil	nil	1.02
Mgutu ...	.15	4.65	4.87	1.29
Muripfumba ...	nil	.67	.67	1.09
Omeath ...	,,	1.66	1.88	1.25
Pearson Settlement ...	,,	3.86	4.08	n.s.
Pembi Ranch ...	,,	.37	.37	n.s.
Riversdale Estate ...	,,	1.24	1.24	n.s.
Ruia ...	,,	.52	.52	1.40
Rustington ...	,,	.27	.27	1.10
Shamva Mine ...	,,	.85	.98	1.32

RAINFALL—*(Continued).*

STATION.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Stanley Kop ...	nil	1.08	1.08	1.23
Sunnyside ...	,,	1.11	1.33	1.30
Teign ...	,,	1.92	2.49	1.34
Usk ...	,,	1.92	1 92	1.42
Virginia ...	,,	1.31	1.31	1 22
Visa ...	,,	*.53	1.08	n.s.
Woodlands ...	,,	1.03	1.06	1.30
Zombi ...	,,	1.42	1 56	1.40
Mrewa—				
Maryland ...	,,	2.25	2.50	1.32
Mrewa ...	,,	2.28	2.52	1.38
Nyaderi Mission ...	,,	1.39	1.61	n.s.
Selous Nek ...	nil	nil	nil	1.32
Mtoko—				
Makaha .	.06	1.22	1 39	1.25
Mtoko (N C.) ..	,,	2.62	3.01	1.10
Salisbury—				
Arcturus ...	nil	2.21	2.41	1.45
Calgary ...	,,	2.42	2.42	n.s.
Chindamora Reserve ...	,,	1.28	1.86	1.30
Chinyika ...	...	...	...	n.s.
Datata ...	nil	3.72	3.95	n s.
Glenara ...	,,	1.64	2.04	1.24
Goromonzi ...	,,	2.09	2.09	1.50
Hatcliffe ...	,,	3.11	3.59	1.32
Hillside (Bromley) ...	,,	1.80	2.24	n.s.
Kilmuir ...	,,	3.35	3.45	n.s.
Meadows ...	,,	3.00	3.06	1 50
Pendennis ...	,,	3.28	3.61	n.s.
Selby ...	,,	2.50	2 75	1.20
Springs ...	,,	1.81	1.81	n s.
Teviotdale ...	,,	2.61	2.61	n.s.
Vainona ...	,,	2.79	3.18	1 31
ZONE E.:				
Belingwe—				
Belingwe (N.C.) ...	nil	.86	.86	1.32
Doro ...	,,	.65	.65	1.40
Shabani ...	,,	1.08	1.26	1.52
Bikita—				
Angus Ranch ...	nil	nil	60	1.35
Bikita ...	,,	1.41	3.50	n.s.
Devuli Ranch ...	,,	2.95	3.25	n s.
Charter—				
Buhera ...	nil	1.97	2 18	1.96
Chibi—				
Chibi ...	nil	.34	.80	1.32
Lundi ...	,,	3.24	6.43	1.20

RAINFALL—(*Continued*).

Station.	1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Chilimanzi—				
Alanberry ...	.02	1.22	1.54	1.58
Driefontein ...	nil	1.23	2.23	1.54
Felixburg ...	,,	1.14	1.44	1.70
Grootfontein ...	,,	1.18	1.67	1.64
Induna Farm ...	,,	2.15	2.39	1.78
Mtao Forest ...	,,	1.69	2.45	n.s.
Mukowries ...	,,	1.47	1.85	n.s.
Requeza Estate ...	...	...	...	n.s.
Thornhill ...	nil	2.55	2 79	n.s.
Gutu—				
Alheit Mission ...	nil	1.46	2.18	1.31
Chindito ...	,,	2.66	3.06	1.83
Eastdale Estate ...	,,	2.98	3.32	1.79
Gutu ...	,,	nil	nil	1.70
Glenary ...	,,	2 19	2.80	1.46
Gwelo—				
Glencraig ...	nil	2.07	2.43	n.s.
Partridge Farm ...	,,	2.19	2.62	2.00
Sheep Run Farm ...	,,	1.03	1.17	1 67
Inyanga—				
St. Trias' Hill ...	nil	1.26	2.91	2.16
Insiza—				
Roodeheuvel ...	nil	1.34	1.46	1.49
Makoni—				
Chirumwe ...	nil	1.68	1.88	n.s.
Craigendoran ...	,,	nil	nil	1.65
Forest Hill ...	,,	.72	.97	1.74
Gorubi Springs ...	,,	1.16	2.80	1.77
Inyagura ...	,,	2.44	2.44	n.s.
Makoni Kop ...	,,	1.84	2.32	n.s.
Mona ...	,,	3.26	3.96	1.97
Monte Cassino ...	,,	2.27	2.86	1.94
Ruati ...	,,	1.55	2.04	n.s.
Rusape (N.C.) ...	,,	nil	nil	1.70
Tablelands ...	,,	1.71	2 62	n.s.
Springs ...	,,	1.73	2.24	1.75
Whitgift ...	,,	2.07	2.20	n.s.
Marandellas—				
Bonongwe ...	nil	1.90	2.11	1.81
Delta ...	,,	nil	nil	1.79
Elandslaagte ...	,,	2 13	2 43	n.s.
Lendy Estates ...	,,	nil	nil	1.93
Lushington ...	,,	1.32	1.68	n.s.
Macheke ...	,,	1.30	1 69	1.97
Marandellas (N.C.) ...	.14	.63	1.42	2 05
Marandellas Estate ...	nil	1.48	1.48	1.81
Nelson ...	,,	2.98	3 23	1 59
Tweedjan ...	,,	nil	nil	1.93
Wedza Reserve ...	,,	1.92	2.20	n.s.
Wenimbi ...	...	...	...	n s.

RAINFALL—(*Continued*).

STATION.		1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(continued)					
Melsetter—					
Brackenbury	...	nil	nil	nil	2 99
New Year's Gift	...	.07	3.44	4.08	n.s.
Sabi Tanganda Estate	...	...	...	...	n.s.
Ndanga—					
Doornfontein	...	nil	1.98	3.32	1.47
Manjirenji	...	. .	...	...	n.s.
Marah Ranch	...	nil	2.15	2.15	1.75
Zaka	...	,,	.92	2.32	2.16
Selukwe—					
Aberfoyle Ranch	...	nil	1.78	2.03	1.75
Hillingdon	...	,,	1.77	2.06	1.77
Impali Source	...	,,	2.44	2.73	1.69
Rio	...	,,	1.75	2.33	1.65
Safago	...	,,	1.63	2.19	1.82
Selukwe Gaol	...	...	4.12	4.12	n.s.
Tokwe Block	...	...	...	...	n.s.
Woodlands	...	nil	nil	nil	1.47
Umtali—					
Argyll	...	nil	2.74	3 17	1.75
Embeza	...	.66	5.49	7 91	n.s.
Fairview	...	..	...	...	n.s.
Fern Valley	...	.02	2.93	3.44	n.s.
Jerain	...	nil	2.96	3.12	1.79
Mutambara Mission	...	,,	3.26	3.26	1.65
Odzani Power Station	...	,,	4.60	6.06	2.03
Park Farm	...	.13	2.90	3.88	2.39
Premier Estate	...	nil	2 71	3.00	1.71
Sarum	...	,,	3.11	3 76	1.59
Sheba	...	.49	5.27	8.83	n.s.
Stapleford	...	.39	5.42	7.11	3 98
St. Augustine's Mission	...	.11	3.19	4.31	2.33
Transsau Estate	...	nil	3.16	3.66	n s.
Umtali Gaol	...	.03	2.72	3.16	1.83
Victoria—					
Brucehame	...	nil	.26	.82	1.55
Cambria	...	,,	1.14	1.57	1.49
Cheveden	...	,,	.83	2.41	2.11
Clipsham	...	,,	1.03	1.57	1.59
Gokomere	...	,,	2.01	2.49	1.61
Kimberley Ranch	...	,,	1.24	1.64	n.s.
Mashaba	...	,,	.97	1.25	n.s.
Miltonia	...	,,	.45	.78	n.s.
M'Sali	...	,,	.44	1.08	n.s.
Riverdene North	...	,,	.52	1.10	1.64
Salemore	...	,,	nil	nil	1.81
Silver Oaks	...	,,	.73	1.45	1.59
Stanmore	...	,,	nil	nil	1.48
Victoria	...	,,	.62	1.12	1.47
Zimbabwe	...	,,	nil	nil	1.97

RAINFALL—(*Continued*).

STATION.		1927. Sept.	1927. Oct.	Total to end of period.	Normal rainfall to end of period.
ZONE F.:					
Melsetter—					
Chikore	...	.05	1.31	4.27	3 21
Chipinga	...	.11	4.24	6.57	3 32
Lettie Swan	...	.26	1.47	3.56	n.s.
Melsetter	...	.10	3.51	4.94	3.51
Mount Selinda	...	.40	3.56	8.17	4.66
Vermont	...	.39	2.48	6.24	3.72
Umtali—					
Chimeze	...	...	...	..	n.s.

Export of Cattle from Southern Rhodesia, 1927.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	151	...	...	1,713	...	...	101	...	...	1,965
February ...	77	...	...	695	...	...	112		...	884
March ...	135	1,837	...	2,375	...	...	50	34	...	4,431
April ...	106	2,574	...	1,440	...	...	28	...	...	4,148
May ...	205	3,458	...	1,299	...	...	118	...	...	5,080
June ...	1,249	6,280	160	1,484	...	...	100	...	...	9,113
July ...	2,569	1,850	...	1,348	50	...	141	...	...	5,958
August ...	955	239	...	2,623	...	...	284	...	...	4,101
September ...	741	8	...	1,422	29	61	110	24	...	2,395
October ...	657	...	...	1,737	...	150	78	...	...	2,622
November ...										
December ...										

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Rhodesian Milk Records.

Name of cow.	Breed.	Milk in lbs. to date	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Yellow Woods Rita	Shorthorn	4,910.50	..	259	J Bazeley, Heany Junc.
Yellow Woods Rachel	do	3,985.00	...	238	do do
Zaakins ..	do	5,719.80	252.43	435	G Cooper, Essexvale
Key ...	do	4,282 50	170.67	402	do do
Mooi ..	do	4,722 80	179.93	408	do do
Flora ..	do	3,449 80	113.28	283	do do
Pepper ...	do	3,888.70	189.05	247	do do
Bella ..	do	3,003.70	104.65	244	do do
Boontje of Kaalplaats	Friesland	4,472.00	..	150	A. T. Holland, Chatsworth
Mary	do	1,950.00	...	60	do do
Phœbe	do	1,158.00	38 70	60	R. R. Sharp, Redbank
Daisy ...	Grade Friesland	1,388.75	..	60	C E Strickland, Shamva
Poppy ..	do	727.75	..	30	do do
Kitty ...	do	820 75	.	30	do do
Julia	do	878.75	...	30	do do
Sally .	do	936 00	...	30	do do
Fanny ..	do	757.50	...	30	do do
Jane ...	do	1,026.00	..	30	do do
D.G. Laura	Friesland	4,447.75	118.60	172	Gwebi Experiment Farm
,, Roza	do	7,656.00	218.84	434	do do
,, Froukje	do	11,069.00	324 92	403	do do
,, de Hoop	do	9.837.75	308.27	347	do do
,, Selma	do	11,224.75	334 19	389	do do
,, Stienser	do	1,214.25	36.61	28	do do
Palm Tree Allie	do	1,137.75	26.27	26	do do
Dorothea ...	Grade Friesland	4,928.75	163 48	202	do do
Hannah .	do	9,005.00	272.17	266	do do
Elsie ...	do	3,415 25	81.08	96	do do
Clara ..	do	4,459.25	132 99	147	do do
Katie .	do	5,576.50	194.11	262	do do
Fanny ...	do	6,344.75	216 26	238	do do
Kleinbloem ..	do	5,126.50	179.89	206	do do
Mooibloem	do	4,743.75	189 19	266	do do
Gladys ...	do	4,056.25	103 63	108	do do
Isa ..	do	2 898.50	72 75	81	do do
Lucy ...	do	5,201.75	149 01	208	do do
Waterbloem	do	4,121.00	105.20	101	do do

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Dec.	Jan.
			1927	1928
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	10	14
Banket Junction	Banket Hotel	F. Potts	2	6
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	29	26
Bindura	Bindura Farmers' Hall	W. E. Fricker	10	14
Bromley	Farmers' Hall, Bromley Siding	C. J. Shirley	7	4
Bubi	Queen's Mine	E. C. Gaudin	13	3
Chakari	Various farms	L. T. Tracey	21	18
Chatsworth	Makowries Farm	A. W. White	3	7
Daisyfield	Daisyfield (Dec.), Somabula (Jan.)	L. E. Edwards	17	14
Darwendale—Trelawney	Various farms	B. Theck	14	11
Eastern Districts	Farmers' Hall, Chidza	A. R. Jones	10	14
Enterprise	Farmers' Hall	James Watson	6	3
Essexvale	Essexvale	C. Geneve	18	15
Felixburg—Gutu	Felixburg Store (Dec.), Gungwe (Jan.)	C. L. Burrows	10	14
Figtree Branch, R.L. and F.A.	Figtree Hotel	E. E. Macpherson	6	3
Gadzema	Gadzema	M. G. Leahy	9	13
Gatooma	Speck's Hotel	B. L. Henderson	17	21
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	10	14
Gazaland (South Melsetter)	Chipinga Hotel	James Ward	5	2
Greystone	Quarrie Farm	P. J. van der Walt		14
Gwanda	Timber Farm (Mr. N. J. B. Nilson)	N. B. Nilson	No fixed	dates
Headlands	Headlands	J. A. Eve		
Hunter's Road	Hunter's Road	J. W. Watkinson	Not	received
Insiza South	Farm Lancaster	J. Campbell	8	12
Inyazura	Inyazura	Major Tulloch	2	6
Lalapansi	Lalapansi	Edmund Chapman	10	14
Lomagundi	Sinoia	F. W. Robertson		
Lomagundi West	Various farms	E. Morton	4	8
Macheke	Macheke	M. J. Palmer		14
Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	J. D. Den	4	1
Makwiro	Makwiro	F. H. Howard	16	20
Makoni	Rusape	—. Munch	10	14

Marandellas	Marandellas Farmers' Hall	C. N. Elliot	2	6
Marandellas, Southern	Various farms	D. J. Gale	7	4
Mashonaland	Mashonaland Farmers' Hall, Salisbury	J. Dennis	9	13
Matabeleland Landowners', Farmers' and Cotton Growers' Association	Library Buildings, Bulawayo	W. A Carnegie	8	12
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	17	21
Mazoe (Concession)	Concession Hotel	A. W. Laurie	9	13
Mazoe (Glendale)	Farmers' Hall, Glendale	S. Davis	14	11
Melsetter	Court House, Melsetter	Dr. Rose	8	12
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	14	11
Ngezi-Umniati	Harvieston, Enkeldoorn	A. F. le Roux	31	28
North Umniati	———	F. J. Eager	Not	received
Norton and Lydiate District	Norton	E. J. Hacking	2	6
Nyamandhlovu	Nyamandhlovu	R. D. McLean	No fixed	dates
Odzi District Farmers	Odzi Hotel	F. H. Burnett	3	7
Poorte Valley	Various places	D. Wilson	17	21
Que Que	Offices of the Que Que Sanitary Board	J. Hogg	17	21
Salisbury South	Various farms	P. Linton	28	25
Selukwe	The Hotel, Selukwe	W. T. Simpson	2	6
Shamva	Shamva Hotel	E. Butler	15	19
Two Rivers Farming Association	Various farms	W. L. Parsons	17	21
Umboe (Branch of Lomagundi F.A.)	Various farms	A. J. Hawkes	10	14
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	H. K. Bracewell	10	14
Umtali	Drill Hall, Umtali	A. Howat	1	5
Umvuma and District	Umvuma	H. B. Collin	Not	received
Victoria	Victoria	H. Payne	9	13
Wankie District	———	W. B. Cumming	Not	received
Western	Plumtree Hotel	W. W. Estment	10	14
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

December.

BEE-KEEPING.

Honey in good quantities will still be coming in, as the welcome rains will be beneficial to veld blooms. Continue to give room by extracting honey from shallow frames, then return these to be refilled. Extracted honey should be drawn from the machine into the honey ripener, into which it should be strained through several thicknesses of butter muslin, remaining there, to allow surplus water to evaporate, for five days, then draw off from the tap into clear white glass bottles. All bottles must be cleansed thoroughly. See that ventilation is ample on hot days.

CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering.

If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil.

All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality.

Continue to rub off all water shoots or suckers which develop on the tree stems.

CROPS.

Good rains may generally be expected during this month, and most crops will be sown. Maize planting, which usually commences in November, can be continued through this month. Maize should be harrowed immediately after planting and at intervals until the young plants are 9 to 10 inches high. Such harrowing should be done in the heat of the day, when the plants are less brittle and liable to injury. Earlier sown cotton will probably require thinning, and ground nuts and velvet beans for seed and green manuring should be planted as early in the month as possible, followed by sunflowers, pumpkins, cattle melons, manna and Sudan grass. Linseed, oats, teff grass, cowpeas, buckwheat, green manuring crops such as Sunn hemp, will follow, and the main potato crop, if not put in earlier, should be planted towards the end of the month. Ensilage crops, such as maize, maize and velvet beans, sunflowers, etc., are best sown about the end of the month. Where new land is to be broken or fields laid back to grass have again to be brought under the plough, the work of ploughing should be undertaken as circumstances permit. Whenever possible such lands should be ploughed in December, January or early February, and reploughed again in April or May.

DAIRYING.

The summer now being far advanced, attention should be given to the percentage of fat in cream, as the cream should contain a higher percentage in the summer than in the winter. Adjust the cream screw of your separator so that you obtain cream testing from 40 to 50 per cent. butter fat. The reason for this is that a heavy bodied cream carries better than one testing only 30 per cent., and will remain sweeter during a long journey. Most separators are adjusted to skim cream testing about 45 per cent. butter fat, and if an excessively high testing cream is produced the efficiency of the separator will be impaired and a loss will be sustained in the separated milk. So do not attempt to separate cream of a higher test than 50 per cent. Cream should be cooled immediately after the milk is separated. This is best done by immersing the bucket containing the cream in a brick and cement trough. Do not mix the new cream with the old cream until next day. Stir the cream thoroughly at least three times per day, and keep it cool pending its despatch to the creamery by allowing the cream can to stand in cold water. In very hot weather use a little preservative, which can be obtained from the creamery on application. Cheese making is now in full swing, and it should be remembered that good cheese cannot be made from tainted or acid milk. Clean milk is essential for cheese making, and it can only be obtained by the provision of a milking shed with an impervious floor. Milking in a muddy kraal will result in a gassy, bitter cheese being produced. During the wet months the provision of a dry, warm shelter for calves is essential. Exposure to inclement conditions of weather and retention of the calves in a filthy, muddy kraal will result most probably in an epidemic of white scour and ophthalmia. Common sense treatment and common sense housing are necessary if dairy calves are to be successfully reared.

During this month provision for winter feed should be made by sowing maize for silage, pumpkins, sweet potatoes, cattle radish, mangels, sunflowers both for seed and silage, ground nuts, teff grass, Boer manna, Sudan grass, beans and cowpeas.

DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits.

Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature.

Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet.

Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth. The first portion of an article dealing with tobacco pests appears in the present

issue. In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. For cutworms see article mentioned. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

Mosquitoes, House Flies, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

FORESTRY.

Give the ground the final harrowing, and if the season is a normal one, planting out should commence. This is the ideal month for planting out in a normal season, as the young trees have the benefit of all the summer rains, and become well established before the dry months arrive. Plant on dull rainy days, or failing such days, late in the afternoons. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tin.

POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in, and making it

damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Turkeys should not be hatched for six weeks prior to the advent of the rainy season, for these youngsters cannot stand damp or cold. Many intend to dispose of the majority of their turkeys for killing at Christmas; those who do so must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of mealies, give during the first week of December one of wheat or mealies in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or mealies, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on freshly prepared soil. Transplanting should be pushed as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertilisers to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should

be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Item.*
	POUNDS.
4.11.27.	A pound has been established at Newbiggin Farm, Chakari, Hartley district, as from 1st November, 1927. (G N. No. 609.)
28.10.27.	The pound established at Newmarch Farm, Hartley district, has been abolished. As from 1st November, 1927, a pound has been established at Stewart's Kopje, on the commonage of Hartley township. (G.N. No. 595.)
	AFRICAN COAST FEVER.
	Charter Native District.
28.10.27	Government Notice No. 598 adds the farm Pennyfather to the area of infection, and includes the farms Wittendale, Seed Farm, Southfield, Crocodile and Crystal in the guard area.
	Umtali Native District.
11.11.27.	Government Notice No. 627 releases the farm Clydesdale from quarantine.

REGULATIONS FOR CONTROLLING THE MOVEMENT OF CATTLE.

1. His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," and the "Animals Diseases Amending Ordinance, 1918," to cancel and withdraw Government Notices Nos. 21 of 1917. 256 of 1918, 595 of 1920, 602 of 1921, 179, 249 and 403 of 1927, and to make the following provisions in lieu thereof; provided, however, that areas of infection and guard areas fixed under the terms of Government Notice No. 21 of 1917 shall be areas of infection and guard areas for the purposes of these regulations.

2. The various districts of Southern Rhodesia are hereby declared infected for the purposes of section 5 (2) of the aforesaid Ordinance, and, save as hereinafter set out, all movement of cattle within the said districts is prohibited until further notice.

3. The following shall be regarded as places within the boundaries of which the movement of cattle may be allowed without special permission.

(a) Single farm.

(b) An area occupied by an owner or lessee, under one management, comprising contiguous farms and situated within an area fixed under section 9 hereof. The mere possession by an owner or lessee of grazing rights over a contiguous farm or farms shall not constitute occupation of such farm or farms.

(c) An area the property of one owner.

(d) Native reserves or portions thereof and Crown land not exempted from the provisions of the "Cattle Cleansing Act, 1927."

(e) On native reserves and Crown land exempted from the provisions of the "Cattle Cleansing Act, 1927," an area within a radius of four miles of the owner's kraal.

(f) An area under the management or control of any municipality, town or village management board.

4. Notwithstanding the provisions of the last preceding section or of section 9 hereof, the Controller of Stock or Chief Inspector may, on the outbreak of disease or for such other cause as may be deemed expedient, direct the isolation or quarantine of cattle on a limited area of the aforesaid places.

5. The movement of cattle from place to place may be permitted under the special permission, in writing, of the Controller of Stock, the Chief Inspector, Inspector, Sub-Inspector or other officer or person duly authorised by the Governor-in-Council to grant such permission.

The granting or refusing of such permission shall be at the sole discretion of the officer authorised to issue the same. Such officer, in considering applications for such permission, shall have regard to the extent to which the "Cattle Cleansing Act, 1927," and any other laws or regulations relating to disease among cattle are being carried out in respect to the cattle or land concerned in the proposed movement, whether the person applying for permission has contravened any of the said laws or regulations or not, and such other matters as may be relevant to the prevention or suppression of cattle diseases.

An appeal from any refusal to issue a permit shall be to the Controller or Chief Inspector of Stock.

6. (1) No special permission to move cattle shall authorise such movement by any route other than a public road, that is, a road the use whereof is common to the public at large, or by a prescribed stock route, without the written consent of the landowners entitled to object to such movement, and in the case of movement across native reserves, without the written consent of the Native Commissioner of the district in which such reserve is situated. The officer entitled to authorise such special permission may refuse to consider the same until furnished by the applicant with written consents as aforesaid.

(2) Whenever a special permission authorises the movement of cattle by a public road or prescribed stock route, the holder of such permission shall, if the number of cattle exceeds fifty, or in the case of bulls, unless led by an attendant for each bull, notify in writing the owner, occupier or manager of occupied land traversed by such road or stock route, or in the case of native reserves, the Native Commissioner of the district in which such reserve is situated, of the number and description of the cattle being moved and the date on which they will cross such land or reserve.

(3) Any person moving cattle without the consents or notices provided for in clauses (1) and (2) hereof respectively shall be deemed guilty of a contravention of these regulations.

7. Cattle moved to any centre for slaughter under the provisions of these or any other regulations shall, on arrival, be immediately taken to such quarantine area (if any) as is provided for the purpose.

8. Cattle admitted to a quarantine area, in terms of the last preceding section, shall be slaughtered within twenty-one days of the date of admission, and shall not be permitted to leave the same except for the purpose of being slaughtered at the appointed abattoir, and if found outside such area, except for the said purpose, may be destroyed on the order of the Controller of Stock or the Chief Inspector; provided, however, that the Controller of Stock or the Chief Inspector may allow the removal of cattle from such area under such conditions as he may prescribe.

9. The movements of cattle for draught purposes may be permitted under the provisions of sections 5 and 6 hereof only within the boundaries of areas fixed for that purpose from time to time by the Governor-in-Council; such movements may be authorised over defined roads for specified periods. Provided that the Controller of Stock or the Chief Inspector may grant special permission in writing for the movement of such cattle under such conditions as he may deem necessary to impose.

10. All cattle in use for draught purposes on any public road shall be clearly and distinctly branded with the registered brand of the owner.

11. All wagons or other vehicles drawn by cattle, in terms of the preceding sections, shall have the owner's name and address legibly and permanently inscribed on the right side thereof.

12. All permits for the removal of cattle issued under the provisions of these regulations shall specify legibly and clearly on the face thereof the place from and to which such cattle may be removed, the route by which they shall travel, the number of such cattle, the time allowed for the journey, and such other particulars and conditions as it may be deemed expedient to provide.

13. No permit issued for the movement of cattle shall be taken to authorise any trespass in connection with such movement.

14. The following provisions shall apply to areas infected with African Coast Fever.

15. On the outbreak or suspected outbreak of disease, the Governor-in-Council may declare an area of infection around and embracing the place of outbreak or suspected outbreak, and a further area or areas around such area of infection as a guard area, whereupon all movement of cattle into and from place to place within such area or areas shall be immediately suspended except as is hereinafter provided.

(1) In areas of infection and guard areas:—

(a) Cattle in transit by rail may be moved through such area.

(b) Cattle may be detrained within such area or areas en route to destination for the purpose of being fed or watered or transferred to another truck.

(c) The Controller of Stock or Chief Inspector may, under such safeguards as he deems expedient, allow cattle to be brought into and thereafter leave any such area for a point outside thereof; provided that they are brought in by rail for the purposes of inoculation or en route to their destination.

(d) Cattle for bona fide farming, dairy and slaughter purposes may be moved into such area or areas by permission of the Controller of Stock or Chief Inspector and under such conditions as he may impose.

(2) In guard area only:—

Cattle may be moved into and from place to place within such area under the conditions of section 6 hereof.

(3) Cattle may be moved from an area of infection or guard area to the Veterinary Research Station, Salisbury, under such conditions as the Controller of Stock or Chief Inspector may deem expedient.

(4) Cattle may be moved from an area of infection or guard area to the Cold Storage Abattoirs, Bulawayo, under such conditions as the Controller of Stock or Chief Inspector may deem expedient. On the arrival of such cattle at the said abattoirs they shall be placed immediately in an enclosure approved of by the Controller of Stock or Chief Inspector, and shall be slaughtered within four days of admittance thereto.

16. Every owner of cattle within areas defined under section 15 shall cause the same to be dipped in an approved dipping solution, and in a tank so constructed as to permit of total immersion of cattle, at such intervals as the Controller of Stock or Chief Inspector shall consider expedient; provided that such owner shall have received reasonable notice in writing beforehand as to the intervals at which his cattle are to be dipped.

17. Every owner of cattle within areas defined under section 15 shall, if required to do so by an Inspector, apply an effective tick-destroying dressing approved of by the Controller of Stock or Chief Inspector to

the ears and tails of such cattle, for which said purpose an Inspector may require an owner to clip the brushes of the tails of such cattle or may otherwise prescribe the manner in which said dressings shall be applied.

18. A permit for a terminal movement of cattle into an infected or guard area, or from one place to another in a guard area, shall authorise the drawing of a wagon or other vehicle by such cattle.

19. The removal of green forage, hay, fodder, bedding, reeds, manure, or of such other articles as may reasonably be supposed capable of conveying infection, shall be prohibited from areas of infection, save and except with the special permission of the Governor-in-Council.

20. Every person within an area of infection or guard area, or within such further area as may be specified by Government Notice, owning or in charge of cattle, shall, upon the death or slaughter because of disease, suspected disease or accident of any such cattle, immediately report such occurrence through the nearest Cattle Inspector, Native Commissioner or Police Officer to the District Veterinary Surgeon.

21. In areas of infection and guard areas no cattle shall be destroyed and no post-mortem examination shall be held on any cattle without the consent of an Inspector or Sub-Inspector.

22. Notwithstanding the provisions of these regulations, it shall be competent for the Controller of Stock or Chief Inspector to authorise and direct the movement of cattle—

(1) for the purpose of isolating, dipping, quarantine or any other such objects as may be deemed necessary to prevent or suppress an outbreak of disease;

(2) for the purpose of obtaining food and water;

at his discretion and under such conditions as he may prescribe.

23. Whenever an area shall have been declared an area of infection or guard area, any person who shall, by his own act or neglect or that of his herds, allow any cattle to stray or be otherwise removed, except as provided for in these regulations, from any one place within such area to another place, or from a place outside of to a place within such area, shall be guilty of an offence against these regulations.

24. In all areas of infection and guard areas sheep and goats shall be dipped at such periods as may be directed by the Controller of Stock or Chief Inspector.

25. Any person contravening the provisions of these regulations, or the conditions set out in permits issued thereunder, shall, where no higher penalty has been by the said Ordinance or any other law provided, be liable in respect of each offence to a fine not exceeding £20, or in default of payment to imprisonment with or without hard labour for a period not exceeding three months. (G.N. No. 641 of 18th November, 1927.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 327. Linseed, by C. Mainwaring.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 388. Kudzu Vine, by H. G. Mundy, F.L.S.
No. 394. The Interdependence of Crop Rotation and Mixed Farming, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 422. Improvement of Rhodesian White Maize by Selection, by C. Mainwaring.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 464. Ensilage, by J. A. T. Walters, B.A.
No. 499. Maize Production on the Sand Veld, by H. G. Mundy, Dip.Agr., F.L.S., Chief Agriculturist.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 552. Mixed Farming in Matabeleland, by Gordon Cooper.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 571. A Farmers' Calendar of Crop Sowings, by C. Mainwaring.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

Botanical Specimens for Identification.
Maize Grading Regulations.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
No. 492. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1922-23, by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

TOBACCO.

No. 582. Tobacco Culture in Southern Rhodesia—Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 614. Notes on Installing the Johnson Patent Furnace, by B. G. Gundry, Office of Irrigation Engineer.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
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